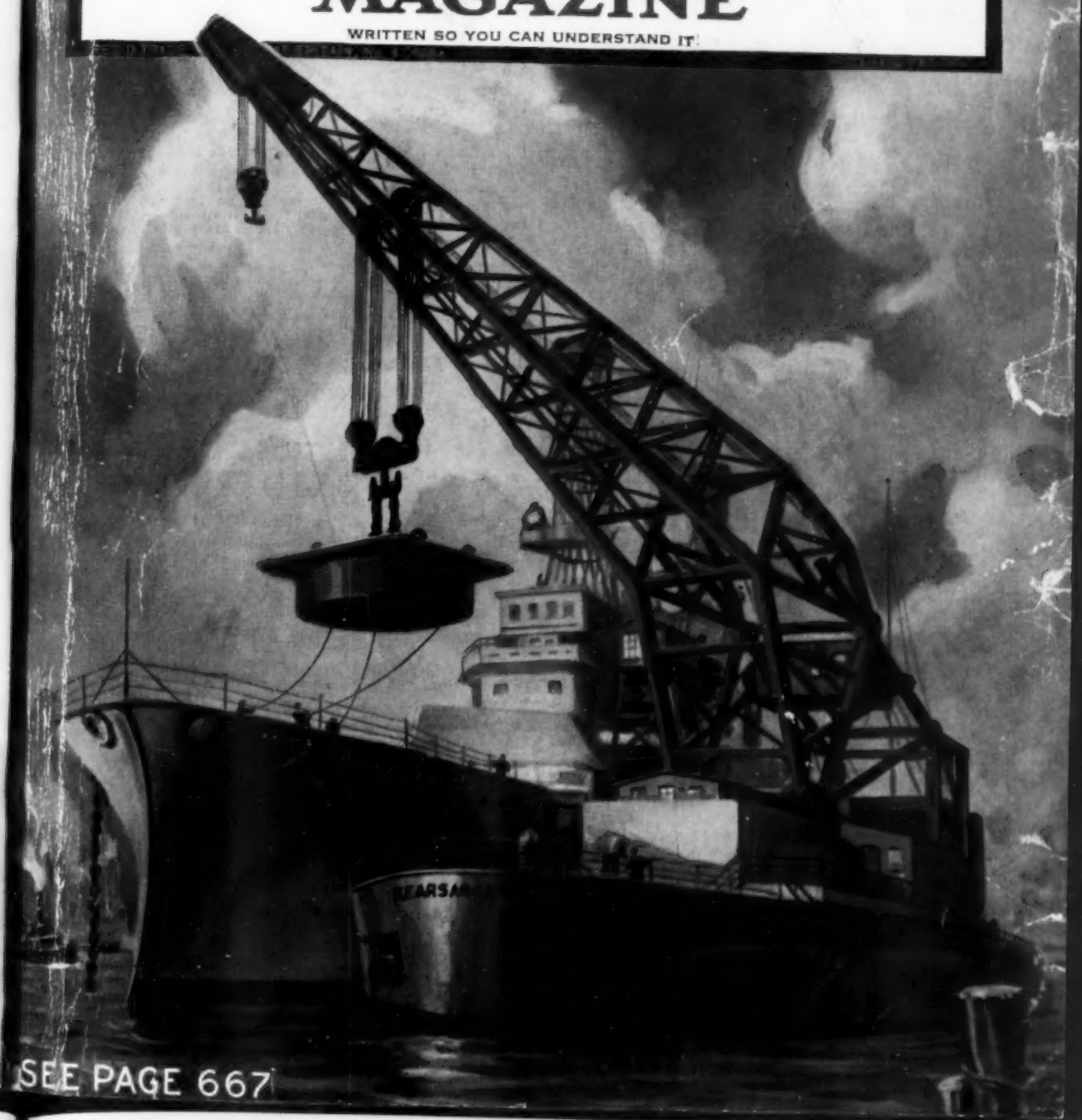
May APR 14 1922 25 Cents

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



SEE PAGE 667

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VOL. 36

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SEE PAGE 667

PRIZE OFFERS

WHETHER YOUR NAME BE LUCKY OR NOT DECIDED BY HOROSCOPE MEANS

A novel means of attracting readers—so novel that it is not only copyrighted, but is also the subject of a patent application—is a prominent feature these days of the Chicago Daily Tribune. Every day a blank is printed in a corner of a page of the paper, that contains spaces to be filled in, as follows: full name, father's name, mother's name, full address, birthday, and the date sent in. From these data the horoscope editor decides whether the applicant is lucky enough to win one of the following prizes: first, $200; second, $100; third, $50, and 40 or 50 of $5 each. Thus each day some names are lucky, others are luckier, but the luckiest of all will be the name that is finally picked for an additional prize of $10,000. Nobody will dispute the fact that that person will be unusually lucky. It is not stated when this opportunity to "try your luck" will be terminated.

BEST LISTS OF USES OF SHOE POLISHES WILL BE AWARDED CASH PRIZES

It has been found that the shoe polishes known as 2-in-1 Black, 2-in-1 White, and 2-in-1 Tan Paste, can be used for other purposes besides shining shoes. The manufacturers, therefore, are offering the following cash prizes for the best lists of new uses of these polishes separately or in combination: First, $500; second, $300; third, $200; 10 of $25 each; 20 of $15 each; 50 of $5 each; 50 of $2 each, and 100 of $1 each. The rules are: Write on one side of the paper only, and list uses according to colors. Awards will be made on or before Oct. 1, 1922. Address: Prize Editor, F. F. Dalley Company of New York, 277 Military Road, Buffalo, N. Y.

ONE-HUNDRED-DOLLAR PRIZE OFFERED FOR BEST SETTING OF A SONG

Announcement is made of a competition for a prize of $100 for the best musical setting of Sir Walter Scott's poem, "Hunting Song," by the Swift & Company Male Chorus. The conditions are as follows: The composer must be a resident of the United States. The setting must be for chorus of men's voices with piano accompaniment. The composition must sing well, and should be kept within a reasonable vocal compass. Parts may be doubled at pleasure. Each composition must bear a fictitious name, and must be accompanied by a sealed envelope bearing on the outside the fictitious name and having inside the composer's real name and address. For return of manuscript, loose stamps should be inclosed.

Competitions should be sent to the conductor of the chorus, D. A. Clippinger, 617-18 Kimball Building, Chicago, Ill., and must be in his hands on or before July 1, 1922. The award will be made Aug. 1, 1922. The composition winning the prize will be produced by the chorus, whose property it becomes, during the season of 1922-1923.

PRIZE-POSTER CONTEST FOR SCHOOLS TO TEACH KINDNESS TO ANIMALS

Pupils in the public and private schools of Massachusetts are offered an incentive to join in the eighth national observance of "Be Kind to Animals Week (April 24-29) and Humane Sunday" (April 30), through the interest of the Massachusetts Society for the Prevention of Cruelty to Animals, which for the best posters received before April 18 will give nine annual subscriptions to its publication, Our Dumb Animals, and nine cash prizes as follows: For pupils in high schools, training classes, etc., first, $20; second, $15, and third, $10; for pupils in grammar grades above the sixth, and also for pupils in the fifth and sixth grades, first, $15; second, $10, and third, $5. The offer is open to all pupils of public or private schools in Massachusetts. The posters are intended as propaganda in the interests of all dumb animals, domestic or wild. The drawings must be on cardboard or heavy paper of about 14 by 20 in., and should be shipped flat, in time to reach the offices of the Massachusetts S. P. C. A., 180 Longwood Ave., Boston, not later than April 18. The prize-winning posters will be sent to the American Humane Association, Albany, N. Y., to compete in a national prize contest.

SILVER LIFE-SAVING MEDALS AWARDED TO THREE HEROIC NAVY MEN

Three enlisted men in the navy have been awarded silver life-saving medals by the Treasury Department, as follows: Leslie Robert Ebaugh, coxswain, for rescue from drowning of a seaman, and the attempted rescue of another, at Hampton Roads, last May 12; Bernard M. Noonan, seaman, for rescuing from drowning a pharmacist's mate at Bremerton, Wash., last July 5; and Ralph Joseph Martin, chief torpedo man, for rescuing a fireman who was swept overboard from submarine "O-10," April 18, 1921, while en route from Bermuda to New London.

PRIZE OFFERED FOR ANY MAN-PROPELLED AIRPLANE THAT CAN HOP 164 FEET

Some time ago a prize was given to a French performer for hopping 10 meters (nearly 33 ft.) on a winged bicycle. Now another prize of 20,000 francs is offered for the first man-propelled airplane which shall hop 50 meters (164 ft.) over a flat surface once in each of two opposite directions. No artificial buoyancy, or independent assistance, may be employed. The dates for making attempts for the prize in 1922 are April 23-30, June 23-30, July 23-30, September 23-30, and possibly a supplementary date. The competition is open to all nationalities except former enemy nations. Entries, accompanied by a fee of 10 francs, returnable under certain conditions, must be made at least 10 days prior to any of the weeks stated above, to Maison Peugeot, 80 Rue Danton, à Levallois-Perret (Seine), in the name of the competitor, and with the name of the maker of the machine.

MAGICIANS' SECRETS TO BE RESPECTED

MAGICIANS earn their living by mystifying the public. Performances such as "The Vanishing Elephant" and "Passing through a Brick Wall," both of which have been explained in this magazine, are produced not merely at great financial cost for paraphernalia and equipment, but also at the expenditure of much clever brain work and severe physical training. What then—when the magician has perfected his idea and begun to delight large audiences with its presentation—what must be his dismay to have the secrets of his patiently mastered art revealed by the press! To him it is a catastrophe.

Realization of this fact leads to the announcement that henceforth Popular Mechanics Magazine will publish no detailed articles of magicians' performances, but, instead, will cooperate with the American Society of Magicians in protecting the secrets of a form of amusement which has always met with popular favor.—Editor.

TWO EXAMINATIONS FOR COMPUTERS BY U. S. CIVIL SERVICE COMMISSION

The U. S. Civil Service Commission announces an open competitive examination, closing May 2, 1922, for computer (Grades I and II). Vacancies for the Ordnance Department of the War Department, for duty at the various proving grounds within the United States, will be filled from this examination. Entrance salaries for these positions will range as follows: Grade I, from $1,400 to $1,800; Grade II, from $900 to $1,400 a year. The duties of the appointees will be to make ballistic computations. Competitors will not be required to report for examination at any place, but will be rated upon sworn statements of their education and experience. Applicants must have graduated from a four years' high-school course, or have completed a course of study equivalent to that required for such graduation. For Grade I, they must have had at least four years' experience in engineering, or other pursuits involving the application of higher mathematics, and in Grade II, two years of such experience. The equivalent of this in a college, or university of recognized standing, embracing mathematics up to and including integral calculus, and physics and applied mechanics, will also be accepted as a qualification.

The department also announces an open competitive examination for computer, to be held April 26-27, 1922, to fill vacancies in the Coast and Geodetic Survey, for duty in Washington, D. C., at a salary of $1,400 a year, and in Manila, P. I., at $2,000 a year. Appointees whose services are satisfactory will be allowed the bonus granted by congress of $20 a month. The subjects of examination will be mathematics, astronomy, physics, surveying, practical computations, and one foreign language. Applicants may be examined at any place at which this examination is held, regardless of their place of domicile; but only those who have been domiciled in the state in which they reside for at least one year previous to the examination, and who have the county officer's certificate in the application form executed, may become eligible for permanent appointment to service in Washington.

In the examination for computer in the Ordnance Department, all citizens, men or women, who have not reached their 50th birthday, and for computer in the Geodetic Survey, all male citizens who have not reached their 70th birthday on the day of the examination, are eligible.

All desirous of competing should at once apply for form 1312, stating title of the examination, to the Civil Service Commission, Washington, D. C., or to the Secretary of the U. S. Civil Service Board in the applicant's locality.

"HOOSIER TON LITTER CLUB" HELPS INDIANA FARMERS

During the past two years the Department of Agricultural Extension of Purdue University, Lafayette, Ind., has made investigations that proved that the number of pigs raised and marketed per litter is the governing factor in determining the cost of producing pigs. Therefore, in coöperation with the Indiana Livestock Breeders' Association, they formed the "Hoosier Ton Litter Club," which offered a gold medal for any litter of pigs that would weigh 2,000 lb. or more when six months old. In connection with this prize offer the club demonstrates methods of breeding, feeding, and management of hogs which will produce ton litters. Executive committees are appointed in each county or township who explain the plans of the club, enroll members, and appoint committees to inspect and weigh litters according to the rules of the club. Besides the gold medals for litters weighing a ton, silver medals were offered for 1,800-lb. litters, and bronze medals for those of 1,600 pounds.

The idea is decidedly novel, and will doubtless stimulate the interest of all Indiana farmers in animal husbandry. The plan might very well be imitated in other states.

CENSUS THAT WILL SHOW EXACT NUMBER OF SAFETY MEN IN MINING INDUSTRY

It has never been established definitely how many persons in the mining industry are engaged in accident prevention and industrial health work. Now for the first time the National Safety Council, with the coöperation of the Bureau of Mines, is engaged in the compilation of a census of safety men in the mining industry, including also safety men in nonmining industries. It is expected that when this census is completed there will be registered at the headquarters of the National Safety Council in Chicago the name of every man and woman responsible for the safety work of every industrial plant, public utility, municipality, and every organization which devotes any part of its efforts toward the promotion of either industrial or public safety in the United States. The council continually receives requests from all kinds of organizations and associations for help in finding speakers or writers on safety subjects, and the census records will greatly increase the facilities of the council for filling such requests.

SIXTH SWISS SAMPLE FAIR TO BE HELD AT BASLE, APRIL 22 TO MAY 2, 1922

Five annual Swiss sample fairs have already been held in the great exhibition building at Basle, and from the steadily increasing popularity of these shows, it is expected that still greater interest will be taken in the sixth show, which takes place April 22 to May 2, 1922. The principal object of these annual expositions is to develop already existing commercial relations, and to afford opportunities for forming new connections. The sample fairs are also intended to remove conditions resulting from the war, and to help reëstablish international economic relations. The exhibits are confined strictly to Swiss products and manufactured goods. Sales at one of these fairs reached a total of 50,000,000 francs (normally about $10,000,000). Many foreign buyers, including several from this side of the Atlantic, attended the last fair, and still more are expected this year.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Model in Clay by Students of Chicago Art Institute: Prizes, $1,000, $100, and $50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

Best Slogan Describing Razor: Prize $500; announced January issue, 1922; closes June 30; address Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

American-History Essays: Prizes, $3,000 for professors, $2,000 for specialists, $1,000 for school-teachers, $1,000 for students, and $500 for undergraduates in U. S. colleges; announced March issue, 1922; closes May 31. Address, Knights of Columbus Historical Commission, K. of C. Bldg., 199 Massachusetts Ave., Boston, Mass.

¶The National Billiard Association of America has been organized for the purpose of encouraging the game of billiards, and at the same time to correct any evils that are connected with the sport. While doing everything possible to upbuild billiards, it is also the intention of the association to close up any billiard rooms that allow objectionable practices.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 37 MAY, 1922 No. 5

Astonishing Results of Foundation Tests

By HENRY S. WHITE

VERY interesting results have been obtained from the unique tests of the foundation piers and caissons for the new Union Station at Chicago, that were fully described and illustrated in the January issue of this magazine. Since that time the tests have been completed on both piers. On the one with the belled base, having a bearing area of 54½ sq. ft., a load of 970 tons was applied for 10 days continuously, resulting in a total settlement of 1⅛ in., of which ½ in. was found to be due to the compression of the concrete itself. On the other pier, without a belled base, and with a bottom area of 12½ sq. ft., a load of 1,000 tons was applied continuously for six weeks, with a total settlement of 2 in., of which 7/16 in. was due to the compression of the concrete. Thus the remarkable result is shown of a load that was over 13 times the load allowed by the city of Chicago ordinance, with a total settlement at the base of only 1 9/16 inches.

The next test helped to explain this unexpected result, for it proved positively that fully a quarter of the load was carried by the skin friction between the outside surface of the pier and the soil sur-

End of Tunnel to Unsupported Base of Foundation Pier: Bottom of Pier, at the Man's Hand, had been Pushed Down from Top of Tunnel by Load of 260 Tons

Diagram of Shaft and Tunnel, 45 Feet Long, for Examining Results of Tests on Two Foundation Piers: At Left Is the Pier without Belled Base, on Which Skin-Friction Tests were Made after Removal of the Hardpan

rounding it. A shaft, 4 ft. in diameter, was sunk alongside the pier with the belled base to the bottom of it, and a tunnel, 6 ft. in diameter and 45 ft. long, was driven to the bottom of the other pier. The shaft alongside the first pier furnished opportunity for a thorough examination of the soil, which was found to be partly soft, and partly hard clay and gravel. Under the other pier the hardpan was all dug away, leaving the base entirely unsupported. Loads were then applied, and gradually increased until a load of 260 tons was reached, when for the first time the unsupported pier began to move. When the pier had been pushed down about 3 ft., the load was taken off. This proves that the resistance from skin friction alone was at least 250 tons, showing by calculation that there was resistance from friction at the rate of 570 lb. per square foot of the pier's surface. This is the first time a test of this kind has been made, and the results are deemed to be of great value. It is hoped by engineers that these demonstrations will convince the city authorities that the present allowable load could safely be doubled.

NEW PROCESS MAKES COTTON FIREPROOF

BALED cotton, which so easily catches fire, or quickly rots when exposed to the weather, is to be largely saved from both huge losses by a new chemical process which is simple to apply at the time the cotton is ginned and does not injure the quality of the cotton.

Anyone who has touched a match to a piece of cotton batten knows how the flame spreads over the surface in a flash. This has led to the adoption of the term "flash fire" in the cotton industry, and is one of the menaces to be guarded against in shipping or storing cotton bales. Another form of fire risk is the so-called "burrowing fire," which refers to the fire which eats its way into the bale. One would think that this fire hazard was a sufficient handicap to be placed upon any industry, but cotton is also subject to another loss, called "country damage," caused by fermentation among the fibers when the bales are stored in contact with the ground or under adverse weather conditions. This country damage spreads into the bale, and may occasion the loss of as much as 80 per cent of the cotton in the bale.

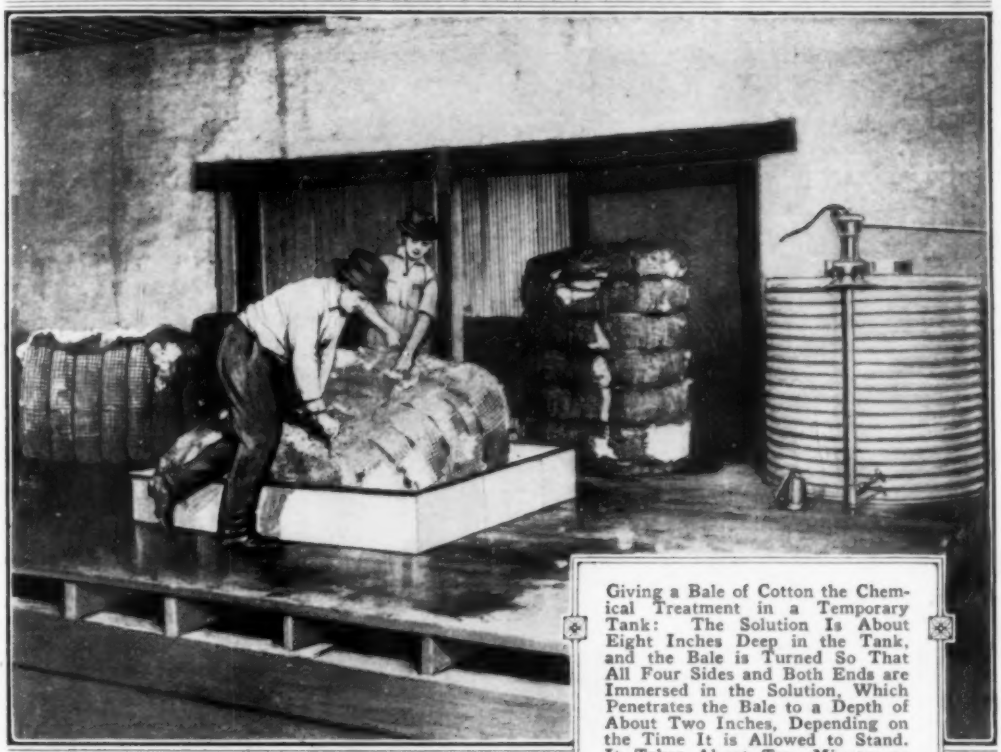
When consideration is given the fact that, with the single exception of corn, cotton is the most valuable of our agricultural products, and far exceeds in value any other exported commodity, the economic importance of any process that will reduce the fire loss and prevent the loss through country damage, can be appreciated.

The process of treatment is extremely simple and has been tested to a point where its commercial value is proved. In treating the gin-baled cotton it is only necessary to roll the bale through an L-shaped vat containing the chemical in such a way that all surfaces are exposed to the liquid. The level of the liquid in the vat is maintained by a float valve controlling the supply from a storage tank. At least two minutes must be consumed in passing the bale through the vat in order to insure a proper penetration of the chemical solution. When it comes from the vat, the bale is placed on a platform and allowed to drain for two or three days, when it is ready for shipment or storage.

Fire tests on the treated bales show that matches and cigar or cigarette stubs may scorch the surface, or even start local flash fires in some cases, but that, as a general rule, these die out quickly without starting burrowing fires. In the exceptional cases where burrowing fires started, they were easily quenched with water. In one particularly rigid test, the flame from a blowtorch was passed over the surface of a treated bale, and while the surface was scorched, no flash fire or burrowing fire was started.

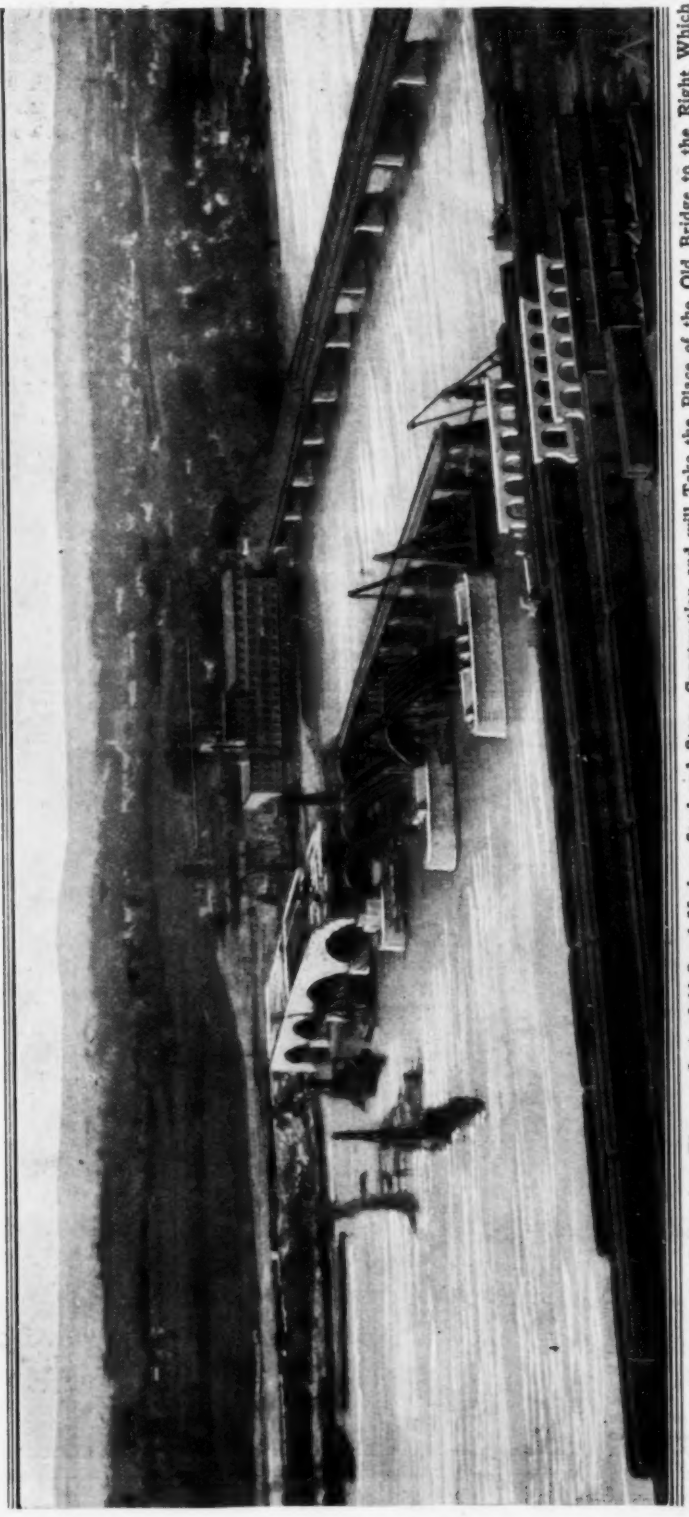
In addition, several tests showed that treated bales were practically fire-resistant to sparks such as would come from a coal-burning locomotive. This fact alone is of great importance, not only to the cotton industry but to the railroads which transport the crop, for it means that cotton may be shipped on flat cars or in ordinary cars without special precautions being taken, as is now the case. As a consequence, the first-grade spark-proof cars can be released for the movement of other crops.

Many tests have shown that treated bales are practically immune from country damage, even when stored under adverse weather conditions. One test showed that the loss after three years was only 2 lb. on a 500-lb. bale, while with the untreated bales the loss in only a few months may range from 80 lb. to as much as 400 lb. per bale.



Giving a Bale of Cotton the Chemical Treatment in a Temporary Tank: The Solution Is About Eight Inches Deep in the Tank, and the Bale is Turned So That All Four Sides and Both Ends are Immersed in the Solution, Which Penetrates the Bale to a Depth of About Two Inches, Depending on the Time It is Allowed to Stand. It Takes About Two Minutes to Apply the Treatment

Testing the Fireproof Quality of a Treated Bale of Cotton by Passing the Flame from a Blowtorch over the Surface: The Chemical Treatment Rendered the Bale Fireproof to Such an Extent That Even This Hot Flame did Not Start Any Flash Fires, or Burrowing Fires; but the Flame from the Torch was Not Allowed to Strike One Spot for Any Length of Time



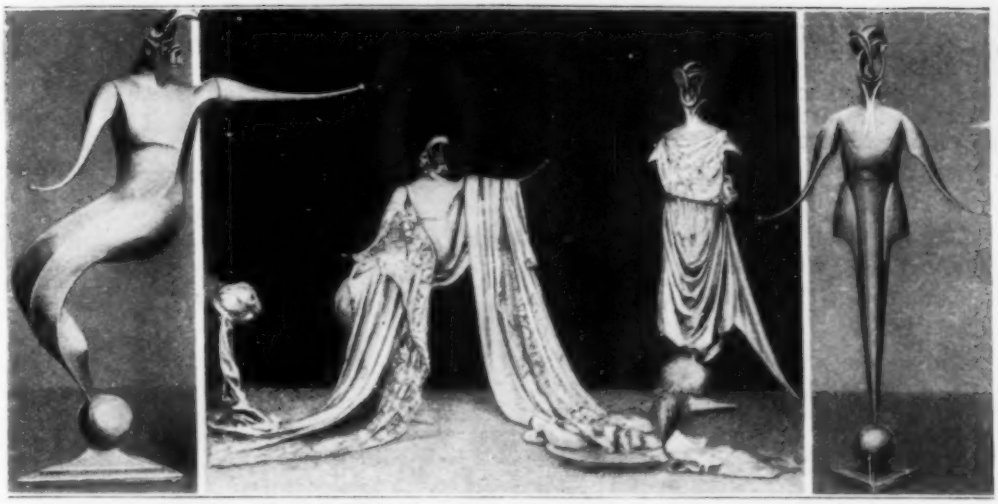
This New Bridge over the Connecticut River at Springfield Is of Modern Steel and Stone Construction and will Take the Place of the Old Bridge to the Right Which has been Condemned as Unsafe for Traffic after having Been in Use, with Few Interruptions, for a Period of 103 Years

NEW VIADUCT REPLACES OLD TOLL BRIDGE

A new bridge is being erected over the Connecticut River at Springfield, Mass., to take the place of the old toll bridge which has been in service since 1816 and is now declared unsafe for traffic. The old bridge is of the two-way, covered type and was constructed of hand-hewn oak timbers held together by hand-wrought iron rods and hardwood pegs. The new bridge is of modern steel and stone construction, and will be 80 ft. wide to allow for car tracks, vehicular and pedestrian traffic. One feature of this bridge is the center span of 172 ft., which is so constructed that it can be replaced by a drawbridge should the river be made navigable for ocean-going boats later.

NEW SUBSTANCE AS CATALYST HARDENS OILS

The process of oil hardening, called hydrogenation, consists in the conversion of oils, which at ordinary temperatures are liquid, into fats which are hard under the same conditions, and depends on the use of a catalyst, which is a substance causing the action but not affected by it. It has been found that a combination of nickel-magnesium silicate gives much better results than any of the catalysts previously used.



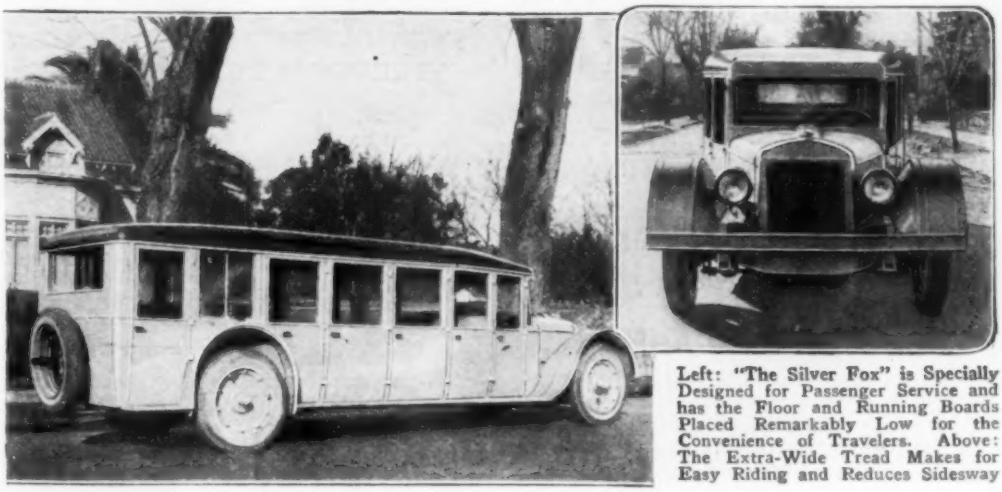
German Substitute Manikins, Made of Metal Instead of Wax: At Left is Shown a Seated Manikin Undraped; to the Right of It, Draped. To the Extreme Right Is a Standing One, and to the Left of It, the Same Manikin Draped. The Manikins Revolve on Balls at Their Feet

GERMANS INTRODUCE MANIKINS OF METAL INSTEAD OF WAX

During the war almost every staple in Germany was replaced by an "ersatz"—a substitute—and now it seems that also in peace time certain substitutes have come into use. One notable instance, that is said to be for the purpose of counteracting French influence, is the substitution of metal manikins for the beautiful wax ones so universal, not only in France, but throughout the whole world of fashion. These lay figures are the invention of a famous German sculptor and are made of such light metal that they can easily be carried about. The arms are jointed, and the whole figure rests on a ball upon which it will revolve.

TWENTY-PASSENGER AUTO BUS IS SPECIALLY DESIGNED

A new passenger-carrying bus, now undergoing its preliminary trials, has been specially designed for this service. The running boards and floor are placed low for convenience in entering and leaving. Sidesway is eliminated to a great extent by the increased width of the tread, which is 68 in. as against the usual 56 in. The bus is equipped with a 64-hp. motor provided with a governor, and is capable of a maximum speed of 52 miles an hour. The interior appointments have been specially designed for the comfort and convenience of the passengers. The motor and driveshaft are supported on fabric or rubber pads to eliminate vibration.



Left: "The Silver Fox" is Specially Designed for Passenger Service and has the Floor and Running Boards Placed Remarkably Low for the Convenience of Travelers. Above: The Extra-Wide Tread Makes for Easy Riding and Reduces Sidesway

VISUALIZE PAPER'S STRENGTH BY NOVEL DEMONSTRATION

A rather unusual method was recently employed to demonstrate the strength of a certain kind of paper. A single sheet

The Single Sheet of Paper is Supporting a Weight of 769 Pounds. The Young Women Seem to Have Perfect Confidence in Its Ability to Hold

of this paper, no heavier than the usual letter stock, was suspended in a frame carrying a seat on which five young women stood and sat. The total weight supported was 769 lb., which included the weight of the platform.

FIGHTING WHEAT-FIELD FIRES IN EASTERN WASHINGTON

In eastern Washington is an agricultural region, known as the Palouse Country, that is devoted almost entirely to wheat raising. Here one may ride mile after mile through what has been aptly termed, by one writer of fiction, a "desert of wheat." After the crop has been successfully nursed through dry winters, wet springs, and dry summers, comes the time of ripening grain and its danger from fire. When the wheat is about ready to harvest, a fire started in it will spread almost instantly, like a prairie fire. Thousands of dollars are lost each year from this cause alone. The causes of the fires are various, many of them being incendiary.

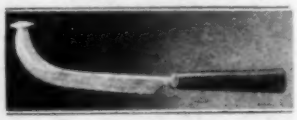
So vital is the success of the wheat crop to the welfare of the region that the business men of Colfax, which is located in the heart of the wheat belt, have organized a volunteer fire department to aid the ranchers in saving their crop. The method used by the ranchers is the same as that employed by the earlier settlers in protecting their homes against prairie fires—a plowed strip ahead of the fire. Also a call for help is telephoned to town.

In town, a special signal is sounded on the fire whistle, and autos and volunteer fire fighters flock to the fire station. A pile of gunny sacks that is kept at the station, is soaked with a stream from the hose. The first auto to arrive is given a load of shovels and these wet sacks. Following autos are loaded with men, and they leave in rapid succession for the fire. Usually, by the time help from town arrives, the rancher and his neighbors have the plowed fire line completed and are ready for the men with the wet sacks. The sacks are used to beat out any small fires that start on the opposite side of the plowed strip.

So common are wheat fires during the harvest season that as many as five or six alarms may be turned in during one day.

SKINNING KNIFE FOR HUNTER PREVENTS CUTTING HIDE

Hunters, or other persons who have occasion to skin wild or domestic animals, will appreciate a new knife invented by an eastern man. The knife has a blade with a sharply curved tip which terminates in an oblong knob. Both edges of the blade are sharpened, and in using, the knob is first inserted between the hide and the flesh. In this position, the knife may be either drawn or pushed without fear of cutting deeper than intended, and without raising the skin with the fingers.



WILL THE LOST TRIBES RETURN TO JERUSALEM?

By Lewis R. Freeman

Characteristic View of the French-Built Railroad, near Homs, in Northern Syria, between Reyak and Aleppo: The Road Is an Almost Continuous Succession of Cuts and Fills, Owing to the Peculiar Conformation of the Country

OUT of the "Grapes of Wrath," trodden in the wine vat of the World War, have flowed strange vintages, most of them bitter if not poisonous. One of the few that sparkles with the bright effervescence of promise is that which typifies the release from their centuries of Turkish bondage of the Jews, Armenians, and Arabs, to say nothing of various and sundry odds and ends of lesser peoples who had long suffered virtual strangulation in the grip of the tentacles of the dying Ottoman octopus. The difficulty of extending succor to the young Armenian republic may mean that it will yet have to face for many years the threat of Turk and Bolshevik; but for the Jews of Palestine—with a strong but liberal British protectorate established, and ultimate autonomy in sight—there is hardly a cloud on the horizon.

And for those who were once called "God's Chosen" the vintage of the war has brought more than freedom—it has

A Group of Pre-War Jewish Colonists in Palestine: They Were, as a Rule, Very Poor and Their Equipment Primitive in the Extreme. Undoubtedly the New Colonization Scheme will Alter All This

brought fulfillment. To the ends of the world Jews are thumbing the pages of Isaiah, Jeremiah, and others once of scant honor in their own country, pointing out how prophecies already come true have opened the way for the fulfillment of others of even greater import, leading up to a virtual renaissance of the race and the establishment of their long-dreamed-of New Jerusalem. I shall discuss here only that covered by two verses from Isaiah. Because the war has made the "highways" referred to a *fait accompli*, that prophecy, with all that its fulfillment seems likely to lead up to, falls fully within the field of a magazine which devotes itself exclusively to accomplished, and accomplishable, facts. Visioning the return of the "Lost Tribes" of Israel, Isaiah wrote (xi:16):

A Section of the Bagdad Railway in Northern Syria: This was Built by the Germans before and during the War, as a Part of Their Ambitious Plan of Connecting Berlin by a Direct Railroad with the Head of the Persian Gulf

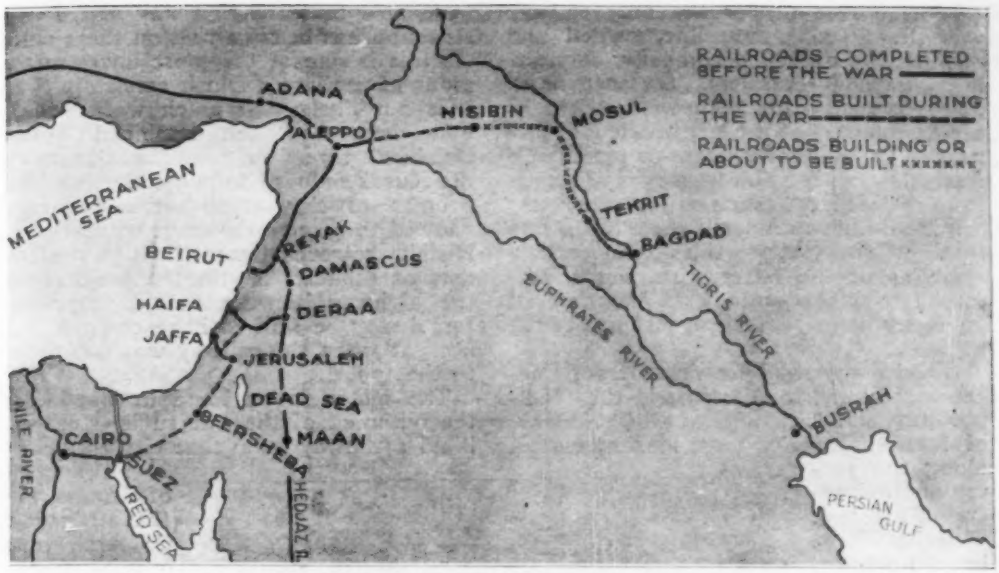
"And there shall be an highway for the remnant of his people, which shall be left, from Assyria; like as it was to Israel in the day that he came up out of the land of Egypt."

And again (xix:23):

"In that day shall there be a highway out of Egypt to Assyria, and the Assyrian shall come into Egypt, and the Egyptian into Assyria, and the Egyptians shall serve with the Assyrians."

Just what a highway connoted to Isaiah, it would be interesting to know. Doubtless, however, clear-seeing as was the great prophet of the redemption, it is not probable that he visualized much more than a long series of wells and tanks, khans, and caravansaries, marking the windings of a dusty camel and ass-beaten path across the desert. Certainly, not in the farthest-flung vista of his vision could he have seen the glistening tracks, the thundering trains, the crowded station yards that differentiate the modern railway and railway travel from that by the ancient caravan. And yet it is in the railway that the prophecy comes to fulfillment. From thousands of miles beyond the outermost limits of the known world of Isaiah's time it is now possible to reach Jerusalem by rail. The highway from Egypt to Assyria, via Palestine, is an accomplished fact; but that (save as it fulfills the letter of the prophecy) seems hardly more than a negligible incidental when one learns that the whole of the European railway system, together with great and increasing lengths of those of Africa and Asia, have been brought—almost overnight as it were—in rail connection with Jerusalem. No matter whither, on any one of these three continents, the most restless remnant of any of the lost tribes has wandered, there are few who would have to march for more than a day or two to reach a highway that will lead them back to Israel. To what extent they will bring about the fulfillment of other prophecies by returning, still remains to be seen.

Just how much the war and the pressing transportation needs of the belligerents put forward the establishment of through rail connection between Jerusalem and the world to the east and west and south, it is hard to say. Even had the war not come, so that Palestine and Syria would have remained under Turkish control, it is still conceivable that a roundabout connection with the Bagdad Railway would have been effected in the course of the next eight or ten years. Nevertheless, the facts that the Palestine and Syrian lines were French, though of different gauges, and that the Damascus-Medina line was Turkish, and the Bagdad line German, would have made coöperation to this end very problematical. Still one heard such a connection spoken of frequently in Palestine in the years just



General Map of Palestine, Syria, and Mesopotamia, and Adjacent Territories, Giving an Idea of the Extent to Which the Railways are Developed at Present: It will be Seen That Even Now the Old Prophecy of a "Highway Out of Egypt to Assyria" Is Practically Fulfilled

previous to the war, and perhaps it would eventually have come to pass. A railroad across the barren Sinai Desert to the delta of the Nile, however, I never heard discussed at that time, either in Palestine or Egypt. As the insignificant trade between these two regions was easily handled by the existing steamer service, it is probable that many years would have gone by before Turkey, or even private concessionaires, would have been willing to sink money in what could hardly have been a profitable enterprise. Had not this railway been built as a strategic line, then, it seems likely that there could have been no incentive for its construction until Palestine and Syria had fallen from the palsied hand of the "Sick Man" by their own weight. Without the war, this might not have eventuated for several decades. I shall hardly need to add that there is no possibility of the Jews ever having come to their own while Palestine remained under Ottoman control.

A brief survey of the railway situation in Turkey-in-Asia at the outbreak of the war will be necessary to an understanding of what was accomplished during the war, and a consideration of the possibilities this latter development opens up for the age-long Jewish dream of a New Israel in a restored Palestine.

By the middle of 1914, the Bagdad Railway (under construction by German concessionaires as the backbone of their grandiose plan of eastward penetration) was, save for a number of heavy cuts and tunnels in the Taurus and Amanus mountains, complete from the Bosporus to the Euphrates. The bridge over the latter, at a point not far from Aleppo, was well under way, and some preliminary work had been done on the eastward extension to Mosul, opposite the site of old Nineveh, on the Tigris. At the opposite end of the survey, working with material brought up the Tigris from the Persian Gulf, the grading had been completed from Bagdad to Samara, 60 miles north of the ancient capital of the caliphs.

In Syria a French-constructed and operated railway ran from Beirut, over the Lebanon Mountains to Reyak, from where one branch ran northeasterly to Homs and Aleppo, and another southeasterly, across the Anti-Lebanon Range, to Damascus. From the latter metropolis the German-built but Turkish-operated Hedjaz Railway ran almost due south, across a bleak and sterile desert, to Medina. This line had been built solely with the idea of handling the pilgrim traffic to Mecca, and Turkish mismanagement had brought it to a hopeless state of disrepair within a year of the time the Ottoman government took over the control. A branch of the Hedjaz line ran from the junction of Deraa, down to the Sea of Galilee and the Jordan—well below sea level—and on to the Mediterranean at Haifa.

In Palestine proper the only railway was the 54-miles-long line, owned and operated by a French company, connecting Jaffa and Jerusalem. On account of its open roadstead, Jaffa was useless as a port for days at a time, which fact had set the Turkish government to planning a connection with Haifa by means of a spur from the Hedjaz branch to Jerusalem. As this would have rendered the French line from Jaffa almost worthless, the concessionaires of the latter were much perturbed over the outlook at the time of my last visit to Jerusalem, just before the war.

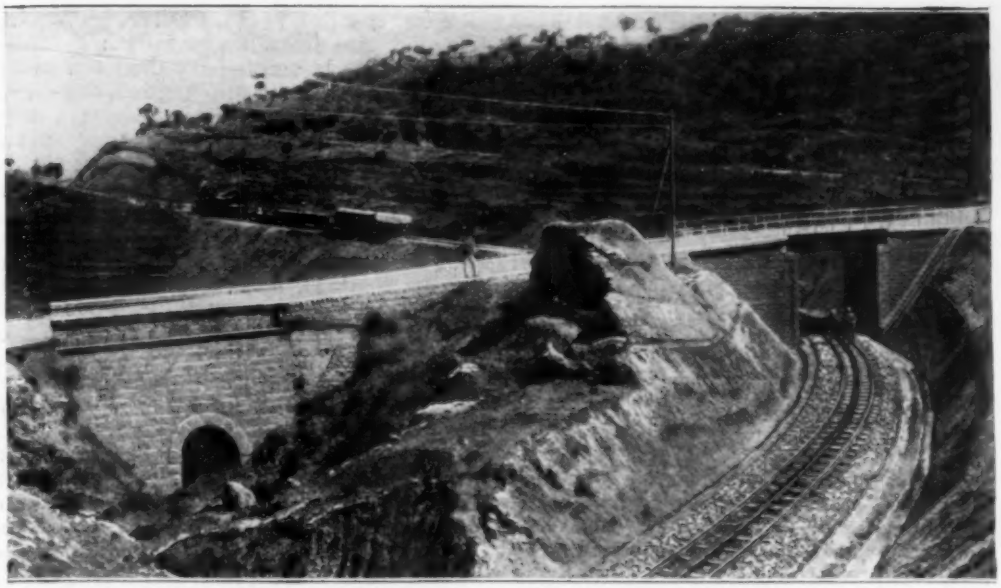
When I crossed by caravan from Bagdad and Mosul to Aleppo and the Mediterranean in the summer of 1912, evidences of feverish activity were observable all along the survey of the Bagdad Railway. This could have been nothing, however, to what went on after the war began, and especially after the inauguration of the first British drive up the Tigris toward Bagdad. That route immediately became the main—indeed, the only—artery of communication of the Turko-German defense, and remained so until that defense crumbled away to nothing in the last year of the war. The greatest effort was made in pushing the Taurus and Amanus tunnels, as that part of the Bagdad Railway was also the main line of communications for the operations in Palestine and Syria. Through traffic was opened to Aleppo in 1916, about the middle of the year.

Section Boss and His Gang on the Hedjaz Railway: The Ties Used Are of Steel, as No Wood could Stand the Climate. This Railroad Is Turkish-Built, and Mainly Serves the Pilgrim Traffic

Meantime, construction had been pushed on across northern Mesopotamia from the completed bridge over the Euphrates, and by the end of 1916, Nisibin, halfway to Mosul, had been reached. The next year saw the completion of the grade to Mosul, but the tremendous demand for steel in Germany made it impossible to supply material for rails and bridges. Nisibin remained practically the railhead, as far as transportation was concerned, to the end of the war, and I have not been able to learn that any active construction has been carried on there since. As this is one of the most unsettled regions of the late Turkish empire in Asia, it is not likely that much work will be done here until the combined Turko-Bolshevik threat to Armenia is removed, the Kurds reduced to subjection, and the peoples of this much-harassed section allowed to resume the ways of peace. As Nisibin, however, lies well within the borders of Biblical Assyria, the prophecy of the highway between that country and Israel may be said to have come to fulfillment when the railway was completed to that point.

The materials on hand in Bagdad at the outbreak of the war sufficed only to build a railway from that city to Tekrit, 20 miles north of Samara, and that strange little Arab town—which received its name from Alexander the Great—was railhead at this end when all of southern Mesopotamia was overrun by the British at the culmination of Maude's masterly campaign. Much grading was found to have been done on the survey north to Mosul, but rails had not been laid. The closing up of the uncompleted gap of the Bagdad Railway need not be a matter of many months, once the country to the north is pacified and the nations concerned (Great Britain and France) in the establishment of a through line from the Mediterranean to the Persian Gulf find the money for the project.

With the French railway from Beirut reaching both Aleppo and Damascus, all the Germans had to do to establish a through line from the Bosporus to Arabia (once the Taurus and Amanus tunnels were completed) was to connect the French and the Hedjaz systems at Damascus, and change the former from a meter gauge to standard. Maan, on the Hedjaz Railway, was made the base for the early Turkish operations across the Sinai Desert against the Suez Canal, but no new line was laid to assist in this



The Narrow-Gauge French-Built Line, Climbing the Mountains Back of Damascus: The Grades Are in Some Places Very Steep; Here, for Instance, the Gradient Is Six per Cent, and a Rack System Was Necessary to Secure Traction

ill-advised and ill-fated operation. It was not until it became apparent that the Turks were to be on the defensive rather than the offensive in Palestine, that each belligerent in this theater began work on lines which, when finally united, effected fulfillment of the prophecy of the highway from Egypt to Assyria.

The Germans, after building a line to connect the Haifa branch of the Hedjaz Railway with that from Jerusalem to Jaffa, pushed construction on southward until Beersheba was reached. This was their expiring effort in railway extension in Palestine, and the result of it was that there was a through, if roundabout, line all the way from the Bosporus to Jerusalem and Beersheba.

When Allenby launched his campaign against the Turks he carried his railway right along with him as he went. It was the sequel to his capture of Beersheba that made possible the welding of the final link in the highway that Isaiah had foretold. Fortunately both lines were standard gauge, so that Allenby's railway trains were almost upon his heels when he marched into Jerusalem. The final defeat of the Turkish army was so complete that little was done in the way of destroying their railways, and consequently the whistle of the locomotive followed close upon the pursuing cavalry all the way up to Damascus and on to Aleppo. At the latter point Allenby reached the Bagdad Railway.

The "Wailing Place" of the Jews, outside the Old Temple Wall at Jerusalem: The Interior of the Temple had been Converted into a Turkish Mosque, So the Jews could Not Enter

So much for the prophecies that have already been fulfilled. Now what of those which it seems certain are about to come to pass? With Israel once more open to them, and with a highway stretching fair before them, will the Lost Tribes return to realize their New Jerusalem? Of many prophecies in point, one from Jeremiah (xxiii:3) will suffice. In its explicitness of expression it is but typical of what Isaiah, Hosea, Joel, and several other of the prophets, have said on the same subject.

"And I will gather the remnant of my flock out of all countries whither I have driven them, and will bring them again to their folds; and they shall be fruitful and increase."

The Jews are found all over the world at the present day. Speaking very broadly, these may be divided into two classes: the descendants of the tribes which were carried into captivity, or who fled to avoid being carried into captivity; and the descendants of later and more voluntary emigrations. The former movement was in the main toward the east, and occurred previous to 586 B. C., the date of the final destruction of the kingdom of Judah by Nebuchadnezzar; the latter movement has been westward, most of it in the Christian Era. The emigration of European Jews to America is the final wave of this westerly drift.

Students of Biblical history will recall that the union of the twelve Hebrew tribes under the warlike Saul, which was further consolidated under David and Solomon, fell into two parts after the death of the latter. That to the north retained the name of the kingdom of Israel, while that to the south, with its capital in Jerusalem, was called Judah. Israel, after sapping its strength with wars with the princes of Damascus, fell an easy victim to the Assyrians, under Sargon, in 722 B. C. All the inhabitants were carried off to Nineveh, and Assyrian colonists sent to replace them. It was because all trace of the expatriates disappeared that they came to be referred to as the Lost Tribes of Israel.

That the lost tribes were, as history tells us, originally planted in the Tigro-Euphrates Valley is evident even to the veriest tyro of an ethnologist who travels in central Asia today. From the source of the Tigris, near the Black Sea, to its confluence with the Euphrates above the head of the Persian Gulf, the unmistakable Hebraic cast of countenance is encountered in every town and village. In the larger cities, such as Diarbekr, Mosul, Bagdad, and Busrah, the Jewish quarters are scarcely less extensive than the Mussulman. In Mosul and Bagdad, the cities nearest to the respective Assyrian and Babylonian capitals of ancient times, business is today very largely in the hands of men whose ancestry would undoubtedly trace back to captives of Sargon and Nebuchadnezzar. For most of these, it will be but the matter of a short journey by *arabanah* [a sort of prairie schooner used in Asia] to reach the beginning of the highway that will take them all the way back to Jerusalem.

How far fragments of the lost tribes wandered eastward will never be definitely known, but unquestionably far into China, if not all the way to the Pacific. One finds Jews in plenty in the bazaars of Kermanshah and Teheran, and right on east across the ancient cradle of civilization from which their Semitic ancestors came. One sees types that are Jewish ethnologically beyond question in the bazaars of Kashgar, Yarkand, and Samarkand, though their religious observances have often been greatly modified by their environment. Farther east still, one finds valleys that are peopled by tribes of unmistakable Jewish origin. In the mountains along the Chinese border they occur only in scattered villages, and by the time one has penetrated 500 miles toward the heart of the Middle Kingdom, the effect of the Jewish immigration is noticeable only in the narrower and more aquiline faces of a type that is predominatingly Mongol. Another 50 miles and the Hebraic cast of features has become exceptional, and beyond that one rarely sees it at all.

The numerous Jews one encounters all over Siberia were carried there by a refluent wave of the later westward movement from Palestine. They all came from European Russia, not from the eastward movement of the lost tribes. Russian Jews have always made up a considerable part of the pilgrims to Jerusalem. Once communication with what was formerly the Russian empire is restored, the trans-Siberian trunk will open through rail connection for all the Jews between the Baltic and the Pacific, right through to the Holy Land. These will undoubtedly figure largely among the new colonists in Palestine.

The many migratory movements between Palestine and Egypt since the time of the Exodus were responsible for the presence of numerous Jews in northern Africa, though those of the bazaars of

A Typical Station on the Jaffa-Jerusalem Railroad: This Road Is 54 Miles Long, Built by a French Company, and Forms a Part of the "Highway of Prophecy"

Cairo, Algiers, and Morocco are mostly the result of the later westward drift. For a hundred years, however, explorers have been finding so-called "Black Jews" in many parts of the Sahara, upper Egypt, Abyssinia, and even as far south as the Nyasa lakes. The warlike Masai, who graze their herds over a vast area of the high country about the head of the Nile, are strikingly Hebraic in appearance, though it is difficult to trace anything Judaistic in their religious observances. In any event, should any of the Black Jews of any part of Africa desire to return to their mother country, the fact that the highway of prophecy connects in lower Egypt with the almost completed Cape-to-Cairo trunk offers the opportunity to do so cheaply and expeditiously.

The Jews of present-day Europe are largely the descendants of those carried away in the early Greek and Roman conquests, or who migrated during the later Byzantine empire, or through opportunities arising in connection with the Crusades. Most of these have preserved the ancient religious observances, and it is they, therefore, who have been most assiduous in rereading and reinterpreting the prophecies, and in laying plans for the establishment of a New Zion upon the ruins of the old. To these the completion of the highway to Jerusalem has particular significance; for, with all of Europe in rail connection with Constantinople, the fact that the steel rails lead on without a break from the other side of the Bosporus right to the foot of Mount Zion means that the next step in fulfillment—the return of the remnants of Israel from all the world—may well be at hand. To one who knows the Palestine of today, the first question that presents itself in connection with the return of any considerable number of the Jewish race is: "Can that dry and barren country support a population greatly in excess of the comparatively sparse one which lives there now?" The answer would be a most emphatic "No," were it not for the fact that the way appears to be open for reclamation which bids fair to make of this desert country another land of Canaan—a land literally flowing with milk and honey. Of the possibilities of restoring Palestine to fruitfulness through general reclamation, and particularly a project for developing power by utilizing the difference in elevation between the Mediterranean and the Dead Sea, I shall write in a later article.

NEVADA LEGISLATURE PASSES LAW FOR CAMEL CONTROL

Camels roaming at will upon the roads and highways of Nevada seems almost like a fairy tale, but the state legislature, in the year of 1875, evidently recognized it to be a most annoying fact. At any rate, at that time a law was passed which prohibited the straying about of these mild-appearing animals that were considered distinctly out of place by the protesting natives, but which had been introduced for hauling purposes at the Virginia City mines. Whether the statute succeeded in safely tethering them is not known, but it is thought that there is no other place in this country that has legislated in this manner against the unassuming camel.

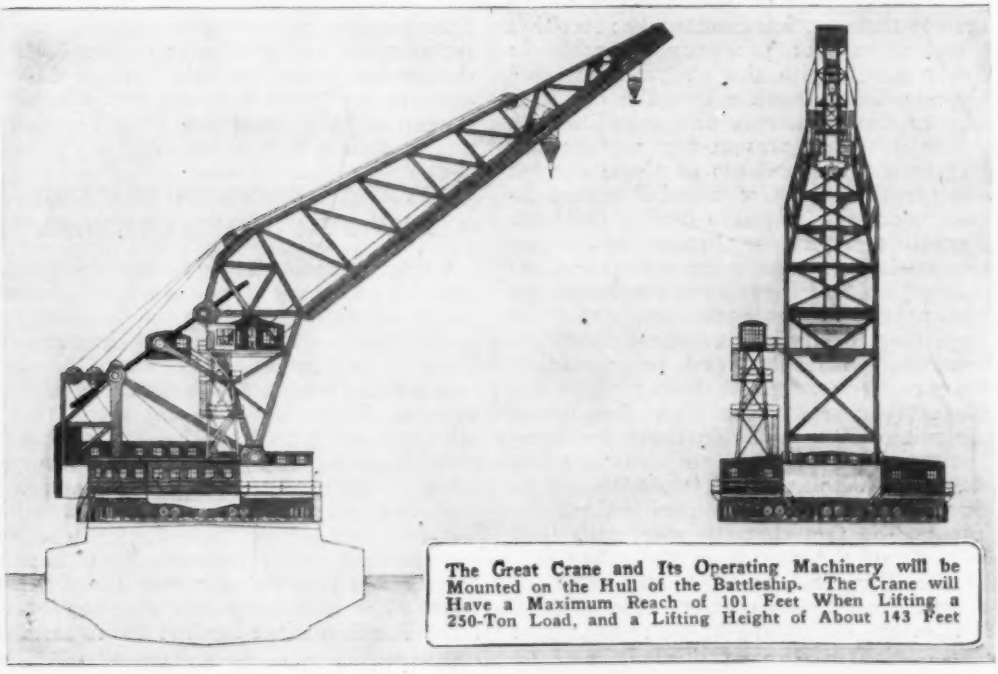
DESERT ROADWAY FENCED TO GUIDE MOTORISTS

Desert Roadway Which has been Fenced to Prevent Touring Motorists from Straying off the Correct Route of Travel, and Consequently becoming Lost. These Barren Stretches of Sand are Often Encountered When Motoring in Some of the Western States

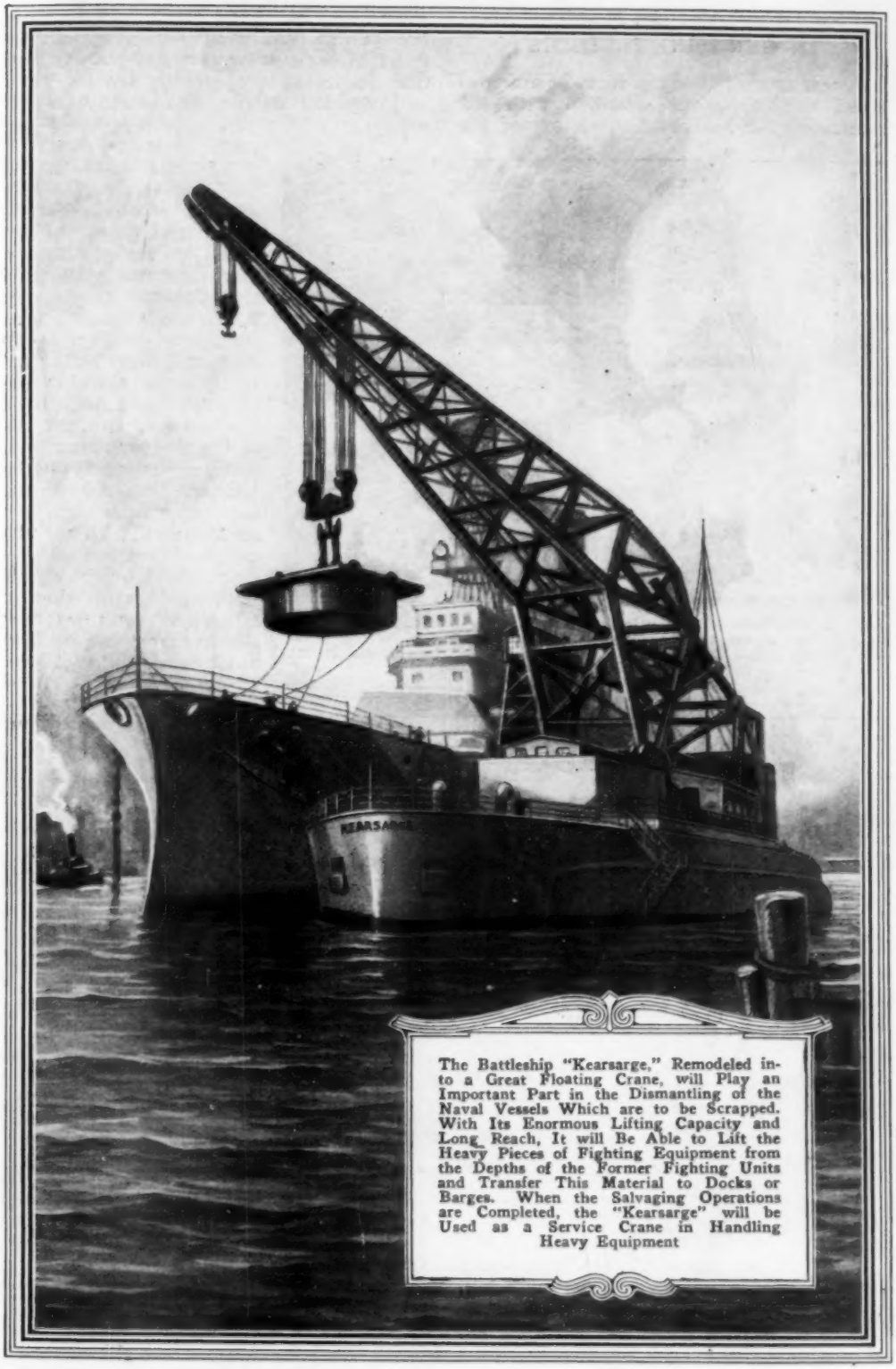
There are several stretches of road in the deserts of western Arizona and eastern California, where the roadways are constantly being filled with sand blown by the strong winds. In many of these sections fences, consisting of iron posts and chains, are used to keep the motorists to the right path. At the seasons of the year when the winds of the deserts are unusually strong and frequent, this novel method of keeping the traveler from going astray proves valuable.

CONVERT GIANT BATTLESHIP INTO FLOATING CRANE

One of the constructive features in the scrapping of the battleships of the navy is the conversion of the "Kearsarge" into a 250-ton floating crane. When the transformation is completed, the crane will bear very little resemblance to the former fighting unit. The hull will remain, but the giant guns and battle turrets will give way to the great boom and its operating machinery. In extended position the crane will have a maximum radius of about 174 ft., with a maximum reach of 101 ft. for a 250-ton load. The total height of lift at the 101-ft. radius will be about 143 ft. The remodeled "Kearsarge" will be used as a service crane and in the dismantling of the battleships which are to be scrapped.



The Great Crane and Its Operating Machinery will be Mounted on the Hull of the Battleship. The Crane will Have a Maximum Reach of 101 Feet When Lifting a 250-Ton Load, and a Lifting Height of About 143 Feet

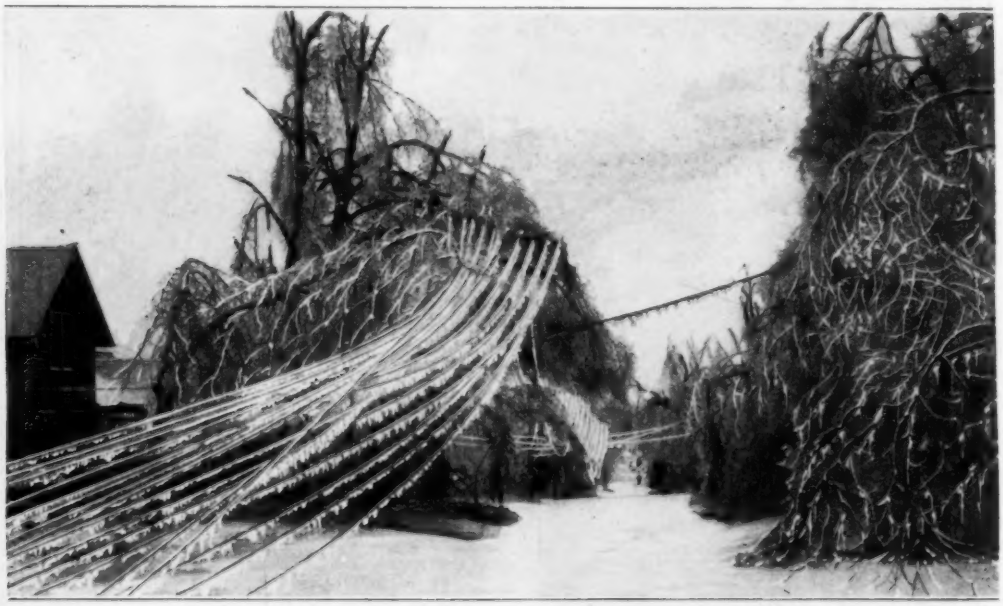


The Battleship "Kearsarge," Remodeled into a Great Floating Crane, will Play an Important Part in the Dismantling of the Naval Vessels Which are to be Scrapped. With Its Enormous Lifting Capacity and Long Reach, It will Be Able to Lift the Heavy Pieces of Fighting Equipment from the Depths of the Former Fighting Units and Transfer This Material to Docks or Barges. When the Salvaging Operations are Completed, the "Kearsarge" will be Used as a Service Crane in Handling Heavy Equipment

SERVICE-BANNER MEMORIAL IN GENESEO, ILLINOIS

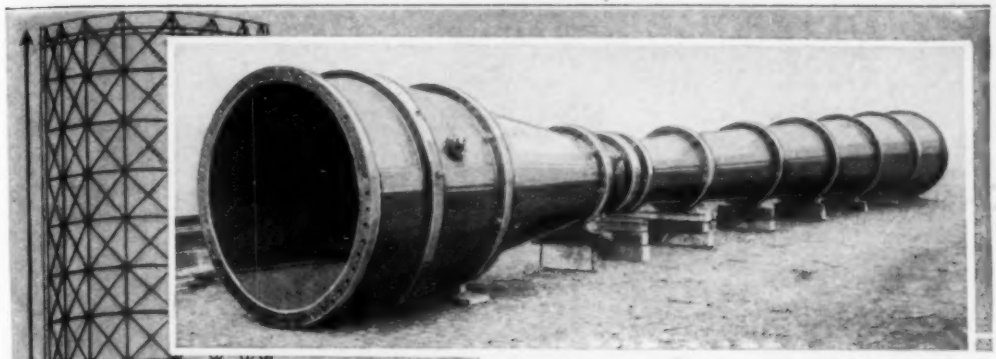
A war memorial in the form of a many-sided service banner inscribed with 497 names of the soldiers and sailors of six townships, has been erected in front of the public library at Geneseo, Ill. In front of each name is a five-pointed star that indicates graphically, by its color and various details, the nature of the man's service, and something of his history. For instance, a plain gold star denotes "died in service," a star with a small medallion on each point means "died in action," and a star with five plain gold tips denotes "died after discharge." This last item is to be kept up to date, and therefore, eventually every star for discharged men will have the five gold tips. A key to the various stars, 15 in number, is part of the banner. The monument is a substantial structure surmounted with a conical roof bearing a flagpole. It is brilliantly illuminated with electric lamps, so arranged that all the names can be read at night.

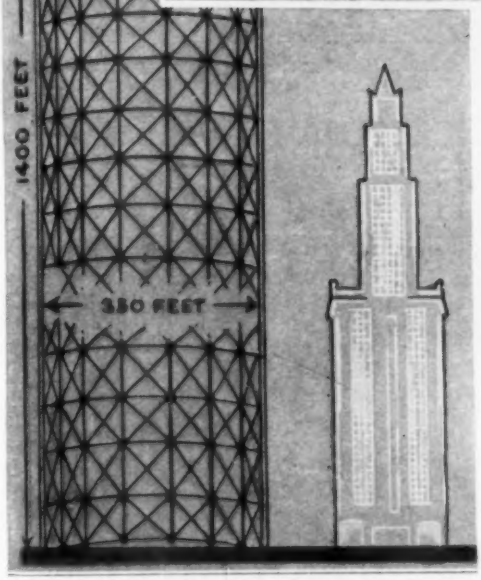
Left: General View of Service-Banner Memorial. Right: Close-Up of Key to Meanings of the Various Stars, 15 in Number, One of Which beside Each Man's Name Denotes, by Its Color and Other Details, the Nature of His Service



SNOW-BOUND CITIES REACH OUTER WORLD BY RADIO

IN the latter part of February, when the state of Wisconsin was visited by one of the worst snow and sleet storms in recent years, untold damage was done to trees and orchards, and all regular forms of communication were put out of commission. Miles of telephone and telegraph wires and power lines were torn down by the weight of the ice coating. In this emergency, radio stations were brought into service and kept the snow-bound cities in touch with the outer world until normal means of communication were reëstablished.





Largest Gas Meter in the World: It Has a Measuring Capacity, per 24 Hours, Sufficient to Fill a Gasometer as Large as That Shown at Extreme Left, Which Compares in Size with Woolworth Building in New York as Shown to the Right of It

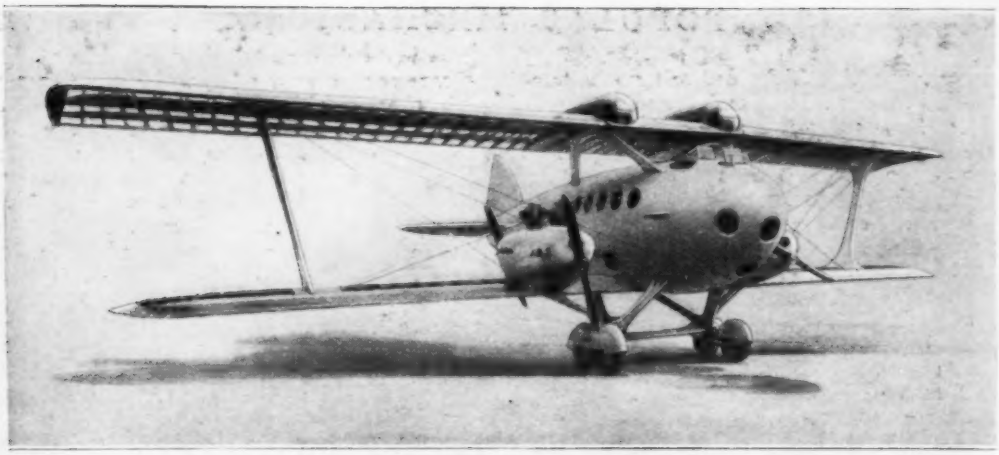
LARGEST VENTURI GAS METER THAT HAS YET BEEN BUILT

What is said to be the largest gas meter in the world, built upon the principle of the Venturi, which consists of a conical, nozzlelike reducer, followed by a gradual enlargement to the original size in a pipe line, is in use at the Bethlehem Steel Company's plant at Sparrow's Point, Md. It is for the purpose of measuring the combustion gases from the blast furnaces, which formerly were wasted, but which for many years now have been a valuable by-product at all steel-producing plants. The meter is 59 ft. long, and the diameter of the pipe line is 72 in., the Venturi throat diameter being 26 in. It is calculated that the measuring capacity of this huge meter per 24 hours is sufficient to fill a gasometer 350 ft. in diameter and 1,400 ft. high, or about twice the height of the Woolworth building, in New York. The meter's rated capacity is 5,700,000 cu. ft. per hour. Although the meter itself is so large, its recording device occupies no more space than an ordinary office desk.

MACHINE FOR SEWING LACE SAVES MUCH LABOR

Lace insertions and lace edgings can be sewed in and trimmed with a machine of recent introduction, which also does lock-stitching and makes French seams. During a demonstration given for manufacturers, the inventor proved that the innovation could sew and trim 100 yd. of lace in an hour. To perform the same amount of work under the present methods, a single girl would require a day and a half, and it is claimed that the new machine will consistently produce an average of 12 times the production of one operator.

Operator Using Motor-Driven Lace-Sewing Machine Which Equals the Production of 12 Hand Workers



In This Blériot Air Liner of French Construction, Great Attention has been Given to the Question of Wind Resistance. The Four Motors are Carried in Pairs on the Lower Wing and are Inclosed in Streamline Housings

GUIDING THE AIR LINER INTO PORT

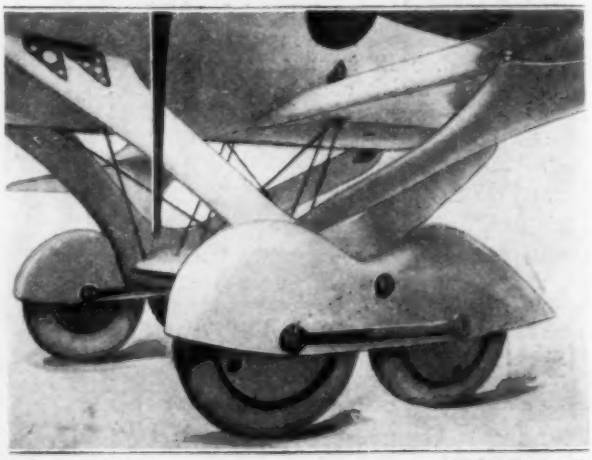
BY EVERETT J. LOVETT

The Interior of the Liner Resembles a Railroad Parlor Car with Its Comfortable Armchairs and Large Observation Windows

COMMERCIAL aviation, particularly in Europe, is fast approaching a point where it is an accepted mode of travel, and the success of the shorter routes has led to the establishment of lines of international scope. As typical examples of some of the present routes might be mentioned those from London to Copenhagen by way of Amsterdam and Hamburg; from Toulouse, France, to Casablanca, North Africa, by way of Barcelona and Gibraltar, and from Cairo to Bagdad; while some account should be taken of some of the proposed routes, such as the one from Paris to Algiers by way of Italy and Sicily, and the route from Paris to Warsaw by way of Strassburg and Prague.

There is no doubt that the history of these longer routes will be only a repetition of the success of the short ones, and that the flying companies feel assured of this, is evidenced by the plans they are making for the safety and comfort of their passengers.

The question of comfort is really of secondary importance and has already been answered in a satisfactory way in the latest limousine planes affording ample space for passengers, and furnished with comfortable armchairs in which one may sit at ease and view, through large ob-



PHOTOS COPYRIGHT, M. ROL

Even the Landing Gear has been Given a Streamlined Housing in the Effort to Reduce Head Resistance to a Minimum. The Struts are Flexibly Hinged to the Fuselage, in Order to Reduce the Shock in Landing

The Great Lighthouse as It will Appear When Erected on Top of Mount Afrique, Nine Miles from Dijon, France: Situated at an Elevation of 1,500 Feet, This Light will Be Visible, under Favorable Conditions, for a Distance of Nearly 200 Miles, and will Be One of the Guiding Beacons on the Paris-Algiers Air Route. Right: The One-Billion-Candlepower Lighthouse as It Appeared Before It was Shipped to Mount Afrique. The Steel Base Is About 18 Feet in Diameter, and the Light is Furnished by Two Banks of Arc Lights Arranged Four in a Group. This Lighthouse Is the Largest Made, Up to Date, for Use in Making Aerial Navigation Safer

servation windows, the varying panorama passing below as the ship speeds on.

As the longer air routes become more popular, as they surely will, there will be more and more necessity of night flying, and the companies are anticipating this by the erection of lighthouses at intervals along the line. Lights of limited intensity and with a visual range of from 20 to 40 miles have been in use on the London-Paris route, but these will be dwarfed by the light that is now being installed on the top of Mt. Afrique, near Dijon, France. This will be of one billion candlepower and will be visible, it is claimed, at a distance of nearly 200 miles under favorable conditions, and will be one of the guideposts on the international airway between France, Italy, and Algeria. Two groups of arc lights, arranged four in a group, will furnish the illumination for this beacon which has taken more than two years to construct. The lenses and lights are carried in a steel tower, 18 ft. in diameter, which will be solidly supported on concrete foundations at the top of the mountain, 1,500 ft. high, adding materially to the visible range of the light.

One of the Smaller Lighthouses on the London-Paris Route is Equipped with Lenses for Throwing a Horizontal Beam, and Four Reflecting Lights Which Project a Vertical Beam

Guided by such giant beacons, the airman will fly confidently through the darkness to the landing field where is located the traffic-control office. This office is in a tower, from which an unobstructed view may be had in all directions, and is equipped with the latest signaling devices, such as pistol flashlamps and electric flashers. As the airman approaches the landing field, automatic lights will show

Above: The Controller of Traffic Using a Pistol Flashlamp from the Balcony of the Control Tower. Left: From the Inside of the Tower He can Communicate with the Approaching Flier by Wireless Telephone and Give Him Special Information as to Ground Conditions. All Landing and Signal Lights are Controlled from the Tower. Right: Using an Electric Flasher to Communicate with the Airman

him the direction and strength of the wind, while the controller of traffic will give him by wireless telephone any special information that he may need for his guidance, such as the amount of fog and ground mist, and the condition of the landing field itself. In this way he will bring his craft into port with the same certainty as the captain of an ocean liner brings his ship into the harbor.

MOVING PICTURES GAIN GRANT OF IMPROVEMENT FUNDS

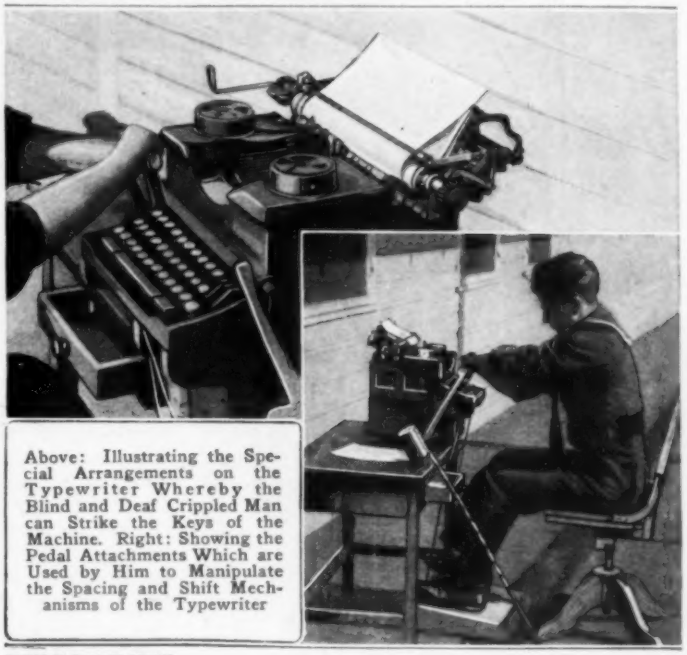
Displaying motion pictures or stereopticon views of contemplated civic improvements for the purpose of obtaining necessary appropriations, is the method used by the Department of Public Works of Philadelphia, when the question comes up before the city council. Heretofore, considerable friction has developed among the aldermen relative to the size and need of various requests for funds to start or complete a municipal project, and principally because the council members were not sufficiently familiar with the work. By showing motion, or other, pictures of each prospective undertaking, together with a lecture on the subject, the city engineers hope to create a better understanding and unity among all parties concerned. The plan was inaugurated with an illustrated discussion of proposed improvements of the city's sewage-disposal system.

GLASS MODELS OF FLOWERS AT HARVARD UNIVERSITY

The artist who modeled the famous "glass flowers," now in the Botanical Museum at Harvard University, is at work on a supplementary collection of glass models of grasses and sedges, which will be exhibited at the university on their completion. The collection now illustrates 160 families of flowering plants, and 803 species. Besides these there are more than 3,200 enlarged details. All the specimens were made by Rudolph Blaschka, who has now in his studio in Germany 20 models and 50 enlarged details, which, when transported to Harvard, will complete the collection.

BLIND AND DEAF CRIPPLE OPERATES TYPEWRITER

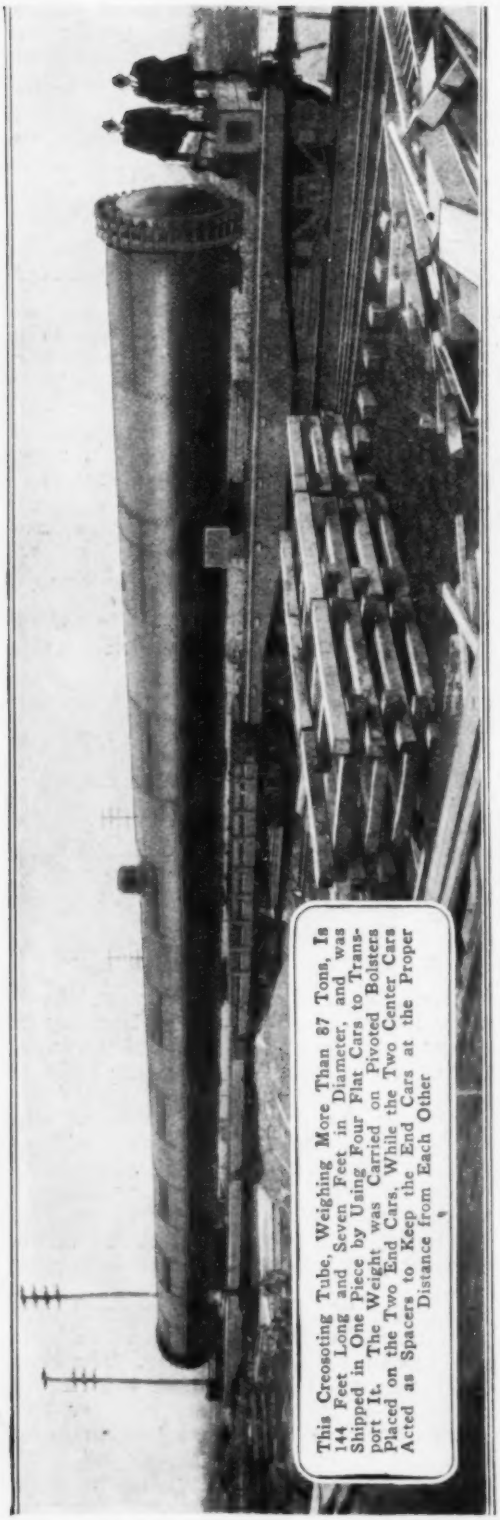
Terribly handicapped by the loss of both hands, eyes, and hearing, a persevering ex-service man has overcome seemingly impossible obstacles in learning to operate a typewriter. Special arrangements on the machine enable the maimed man to strike the keys, while pedal attachments are provided so that he can manipulate the spacing and shift mechanisms. Observers have viewed with astonishment the speed and accuracy attained by the young fellow in spite of his disheartening affliction, and marveled at his great perseverance.



Above: Illustrating the Special Arrangements on the Typewriter Whereby the Blind and Deaf Crippled Man can Strike the Keys of the Machine. Right: Showing the Pedal Attachments Which are Used by Him to Manipulate the Spacing and Shift Mechanisms of the Typewriter

PHOTOS BY GILLIAMS SERVICE

A motor lifeboat of very unusual proportions and characteristics is to be built for use at New Brighton, Eng. The boat will have a displacement of 60 tons, and a passenger-carrying capacity of over 150. Its equipment will include a line-throwing gun, a searchlight, a life-saving net, with first aid, and also heating appliances in its two cabins.



This Creosoting Tube, Weighing More Than 87 Tons, Is 144 Feet Long and Seven Feet in Diameter, and was Shipped in One Piece by Using Four Flat Cars to Transport It. The Weight was Carried on Pivoted Bolsters Placed on the Two End Cars, While the Two Center Cars Acted as Spacers to Keep the End Cars at the Proper Distance from Each Other

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IMMENSE CREOSOTING TUBE MAKES FREAK SHIPMENT

Unusual arrangements characterize the method devised for shipping a recently manufactured tie-treating tube, which is 7 ft. in diameter and 144 ft. long. Four flat cars were needed for the shipment, but only the two end cars carried any weight, the center cars acting solely as fillers. The tube was carried on pivoted bolsters which allowed it to swing when the train was rounding a curve, and much care was exercised in selecting a route which was free from very sharp curves. The tube is to be used in creosoting ties, which will be run in on cars, after which the door is locked and the tube filled with creosote, which will be forced into the ties by subjecting it to a pressure of from 125 to 200 lb. per square inch for a period of four hours.

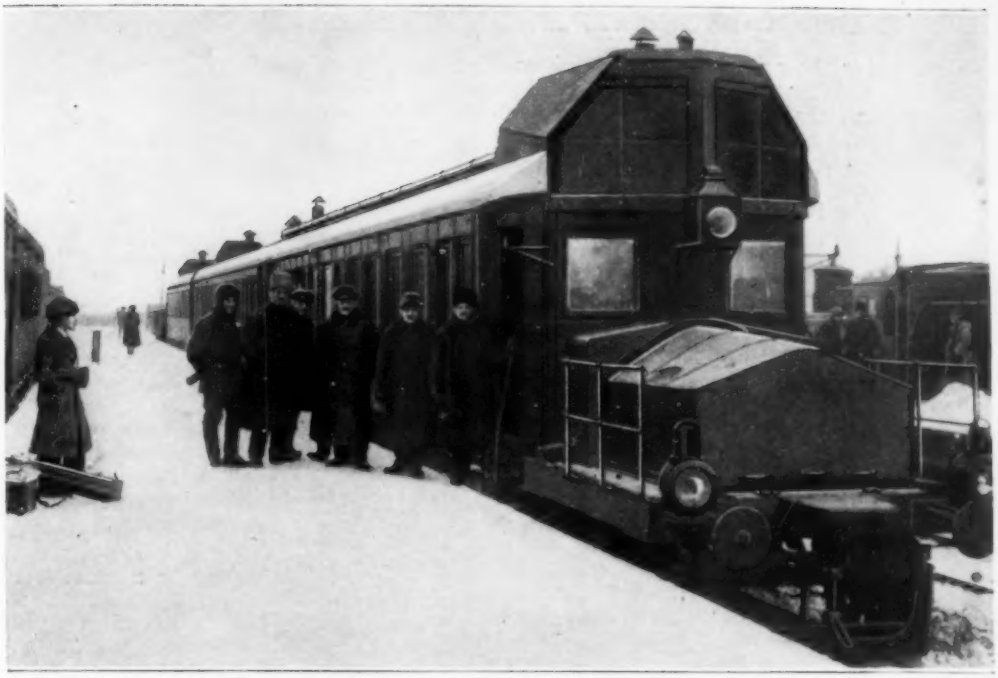
TINTED GLASS FOR PRODUCING ARTIFICIAL DAYLIGHT

For very accurate work in matching colored fabrics under artificial light, a new tinted glass has been developed. An ordinary gas-filled electric bulb is used in combination with a disk of this tinted glass and a reflector coated with a suitable blue pigment, and it is found that the light emerging through the disk more closely resembles natural daylight than any previous combination. A strong light, however, is necessary as almost two-thirds of it is absorbed.

AVERAGE COSTS OF VARIOUS TYPES OF ROAD PAVING

The Bureau of Public Roads has recently compiled figures on the average cost per square yard of various types of paving for country roads, over a period of five years, with the following results: sand-clay, 18 cents; gravel, 46 cents; plain and surface-treated macadam, 95 cents; bituminous macadam, $2.10; bituminous concrete, $2.50; plain cement concrete, $2.57; reinforced cement concrete, $2.74, and brick, $4.10. These figures cover only the cost of paving, and do not include the cost of grading.

¶Because the sea lions and hair seals play havoc with the fishing industries on the British Columbia coast, the Canadian fisheries department plans to attack the seal rookeries on Queen Charlotte Islands with machine guns.



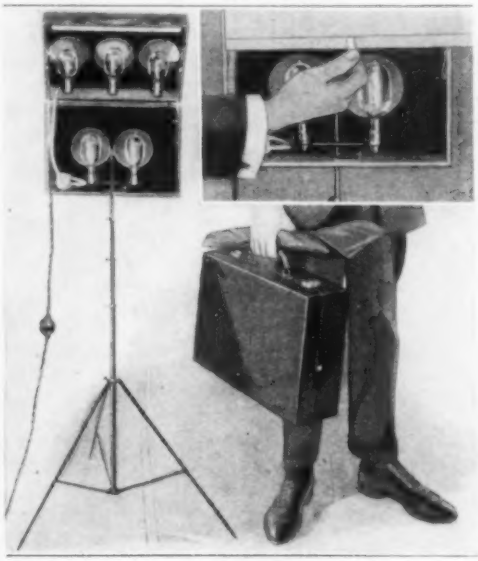
High-Powered Electric Train Now Running between Moscow and Petrograd, in Russia: It is Said to Have 3,000-Horsepower Electric Motors, and to Run the 500 Miles between the Two Cities without Stoppage for Recharging

EXCEEDINGLY HIGH-POWERED RUSSIAN ELECTRIC TRAIN

Recently a new type of electric railway car has been developed in Russia that is said to equal anything of its kind anywhere. Trains of these cars are now running from Moscow to Petrograd, a distance of 500 miles, without stoppage for recharging. The train is said to be equipped with electric motors of 3,000 hp. The Soviet government aided the inventor in the design and development of these high-powered cars, and all details of their construction are being kept secret.

HOME PHOTOGRAPHY IS AIDED BY NEW PORTRAIT LAMP

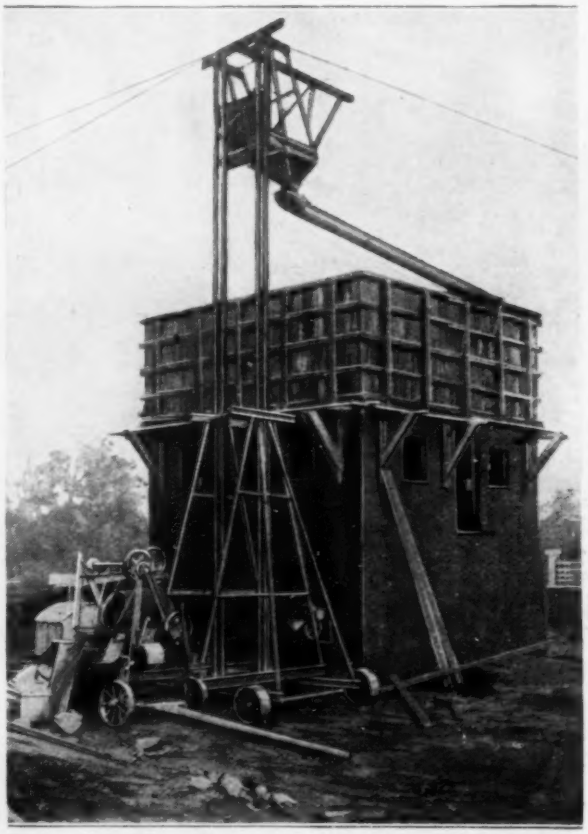
Employing a battery of five 400-watt bulbs, a new portable portrait lamp has been introduced by an Illinois manufacturer, which has great flexibility of operation. The apparatus is constructed in two hinged sections, so arranged that either may be used as a separate unit, and the power of these units may be decreased by unscrewing enough bulbs to meet the requirements of the occasion. In addition, the lamp has special reflectors so that the greatest possible efficiency of lighting effects is procured, and a diffusing screen is also provided. The entire outfit, not including the stand, weighs 12 lb., and can be packed in a 5 by 12 by 17-in. case for carrying purposes.



Left: Portrait Lamp and Stand. Upper Right: Pulling Down the Diffusing Screen. Lower Right: Lamp and Stand Packed for Carrying

FIREPROOF CONCRETE HOUSES BUILT ECONOMICALLY

Concrest is the appropriate name given to a village at East Rochester, N. Y., that is being built entirely of monolithic-concrete houses, each being a villa on its own garden site, and with distinctive individual features of design. These houses have a basement and two stories, with seven rooms, besides an attic, and their concrete construction has been so standardized that it is possible to sell them at a profit for $4,000. A telescoping portable tower, specially designed for this construction, makes it possible, with great economy of labor, to pour one story at a time instead of all three at once. The tower can be raised or lowered to suit each story height, and the concrete is poured from it at a suitable height. Thus, in pouring the basement, without this tower, every bucketful of concrete would have to be raised twice as high as is required with the tower at its lowered position.



Monolithic-Concrete House under Construction: Wooden Forms for Upper Story Are in Place, and Concrete is being Poured from the Telescoping Portable Tower with Its Funnel-Shaped Outlet, Which is Raised to Its Full Height

¶ The Bureau of Mines is seeking a rapid method for the direct determination of the amount of metallic aluminum in commercial aluminum and its alloys and drosses, and also the determination of aluminum oxide in the light alloys. The problem of oxidation of aluminum will also be studied. These investigations are most timely, as the subject of light alloys is one of much importance.

A Corner in the Village of Concrest, with Three Houses in the Foreground That Are Typical of the Rest: Built of Concrete, the Exteriors Are of Tinted Stucco, and the Roofs of Different Colors

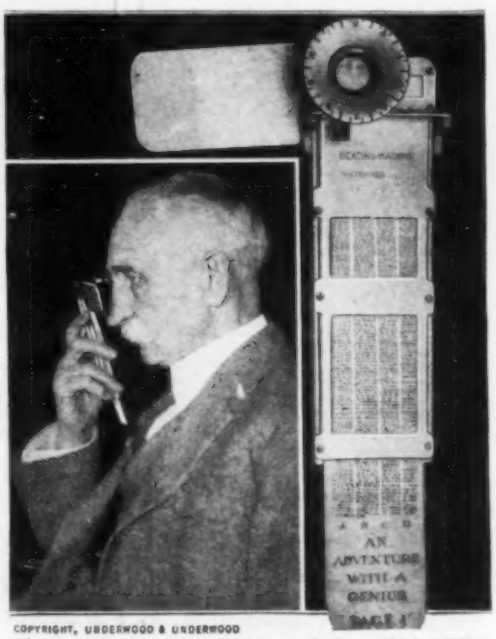
Upper Left: High-Speed Turbine Pump and Other Fire-Fighting Apparatus, Mounted on Ordinary Car. Upper Right: Pump Fitted on Lightweight Engine. Lower Left: Close View of Pump

HIGH-SPEED TURBINE PUMPS PLACED ON MOTOR CARS

The transformation of any pleasure car or truck into an effective fire engine is made possible by the installation of a small high-speed turbine pump, which is designed to be mounted just below the radiator, or at the rear of the machine, and be driven direct from the crankshaft. The pump is built in three sizes by an Italian concern, the smallest being suitable for attachment to a 10 or 12-hp. motor; the medium size for a 25 to 30-hp. motor, while the largest size is made for 50-hp. trucks, and these weigh 77, 187, and 322 lb., respectively. The invention should be of particular interest to small communities unable to afford the more expensive fire equipment.

NEW READING MACHINE MAKES POCKET LIBRARY POSSIBLE

With the use of a new reading machine, a small library may be carried in the vest pocket, according to the claim of its inventor. The instrument makes legible, through a lens, typewritten matter that has been photographically reduced to extreme tabloid size. The typewritten characters are about .01 of their natural size, and are on a strip of paper that fits in a small aluminum frame, at one end of which is mounted a lens and eyepiece. A small roller attached to the frame is moved by the forefinger, and the paper rolls along so that line after line of the reading matter passes the lens. The instrument is 6¼ in. long, 1⅞ in. wide, ¼ in. thick, weighs about 5 oz., and is easily carried in the pocket.



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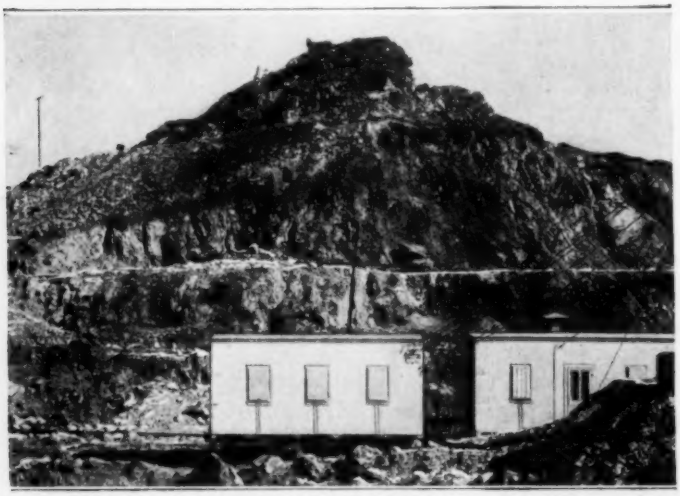
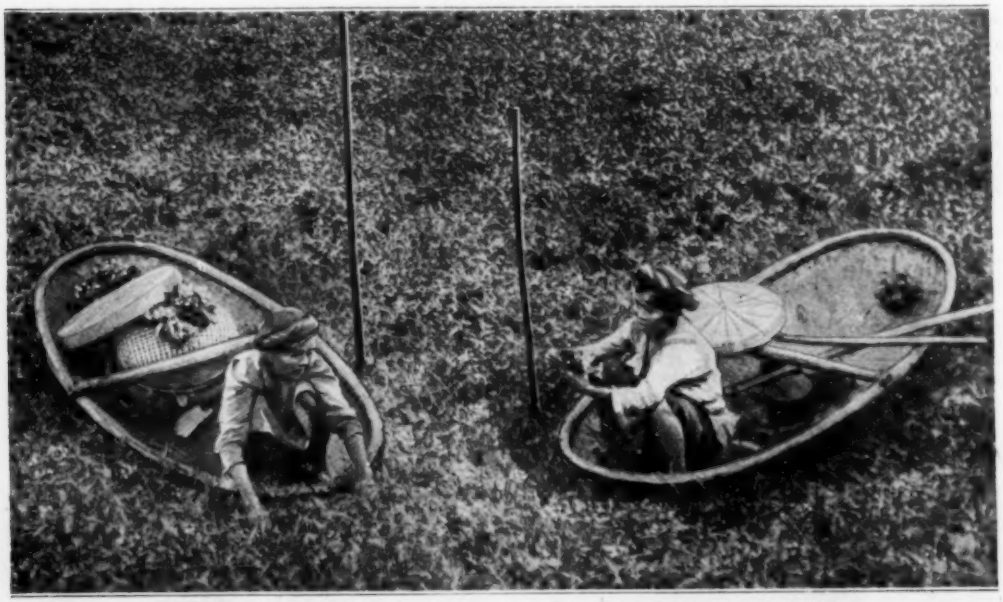
Reading Machine That Uses Reading Matter of Extreme Minuteness, as Seen in the Four Columns on Printed Strip in Its Aluminum Frame. Inset: The Inventor Showing How the Instrument is Used

TRAVELING CRUSHER STATION AND ASSAY OFFICE

As a rule, modern copper-mining operations have to be conducted on a considerable scale, because the high-grade deposits, for the most part, have been exhausted. A case in point is found at Bisbee, Ariz., where the mountain known as Sacramento Hill is copper-bearing, but most of it ranks as low-grade ore, and some is too poor to pay for treatment by ordinary milling, concentrating, and smelting methods. It requires a close control of operations to grade the ore and reject the waste rock. An accurate knowledge of the copper content is possible only by means of chemical analysis. A prompt decision as to how much copper is contained in an exposed face of ore is often necessary, and so a traveling crusher station and assay office has been designed and put in operation, which can be moved on a railroad track as required. Thus it is possible to crush a sample to powder and analyze it for copper right on the spot, and report the result to the operators without delay.

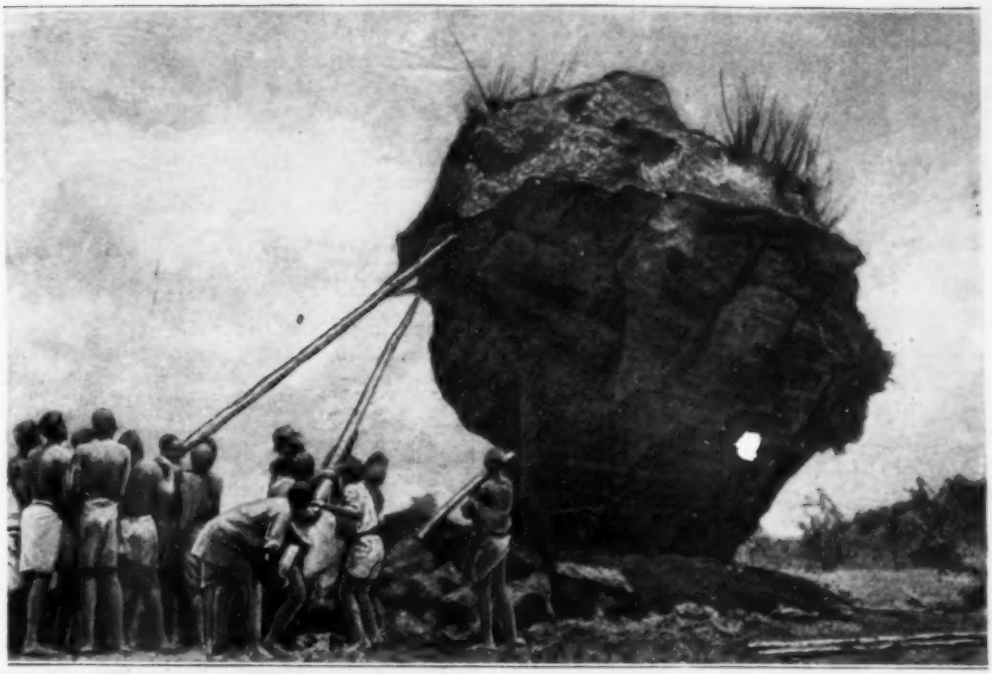


Crusher Station and Assay Office Which Travels by Railroad to the Different Mining Locations Where Samples of Ore are Analyzed and the Results Reported to the Operators



SPINACH PICKERS USE BOATS ON LARGE CHINESE MARSHES

STRANGE methods are employed by the Chinese in the picking of spinach from the large marshes in that country, on which grow vast stretches of this plant. The pickers use small boats of a peculiar shape and construction, two of these being shown in the above photograph. The boats are paddled and pushed around through the thick vegetation until a carefully selected load has been gathered for the market.



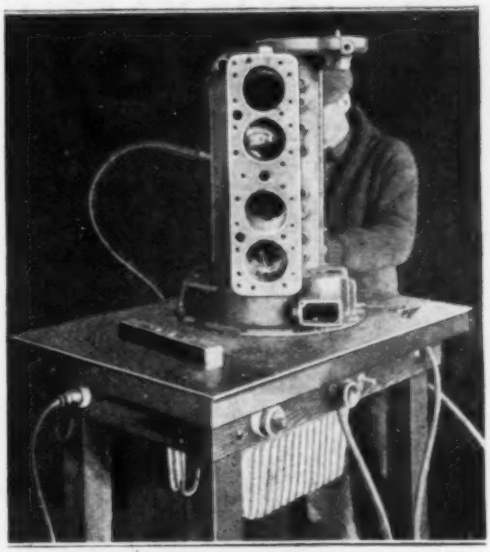
Natives of Rhodesia, Africa, Removing a Mammoth Anthill That Was 25 Feet High, and Was an Obstacle to Cultivation: Anthills of This Kind Are Very Numerous in Rhodesia and the Belgian Congo

SOUTH AFRICAN ANTS BUILD SKYSCRAPER ANTHILLS

Anthills, all over South Africa, but particularly in Rhodesia, are of proportions unknown in America, reaching sometimes a height of 25 ft. or more, and, in spite of the steepness of their sides, covering a very large ground area. They are made of clay, sunbaked to the hardness of bricks, and are the outcome of many years' labor on the part of the industrious ants. Sometimes they are an advantage to the pioneer settlers, often furnishing them with material for making their first homes. At other times they may be an obstacle, preventing the cultivation of the ground they stand on, and then it becomes necessary to remove them. In the case of an anthill 25 ft. high, this is no small task, and may involve as much labor as is required to demolish a fair-sized city building.

ALTERNATING CURRENT USED IN ELECTRIC WELDER

An alternating-current electric welder that does the work as efficiently as with a direct current has been developed by an engineering corporation in Indiana. The welder uses the ordinary city 110-volt current. A patented fusing metal used in the welding point is the most important feature in connection with this welder, and is said to leave the welded metal just as hard as the original metal in any casting. The welder has been used mostly in repairing scored cylinder walls of automobile engines.



Alternating-Current Welder being Used in Repairing the Badly Scored Cylinder Walls in an Automobile Engine: The Welding Point can be Seen in the Bottom Cylinder

IRON PISTONS MADE LIGHT BY SKILLFUL DESIGN

That desirable quality — lightness — is obtained in the pistons of high-speed gasoline engines often by the use of light material, such as aluminum alloys, and sometimes by the use of common cast iron, with the lightness achieved by the scientific construction of the piston. A good example of the latter is one in which strong reinforcing ribs are cast integral with the piston, radiating from a center reinforcing ring in the head and extending down the full length of the wall. These webs, with their large radiating area, aid materially in dissipating the heat, as well as in strengthening the walls and head, and therefore they add to efficiency as well as lessen vibration, and it is said that they greatly increase gas and oil mileage.

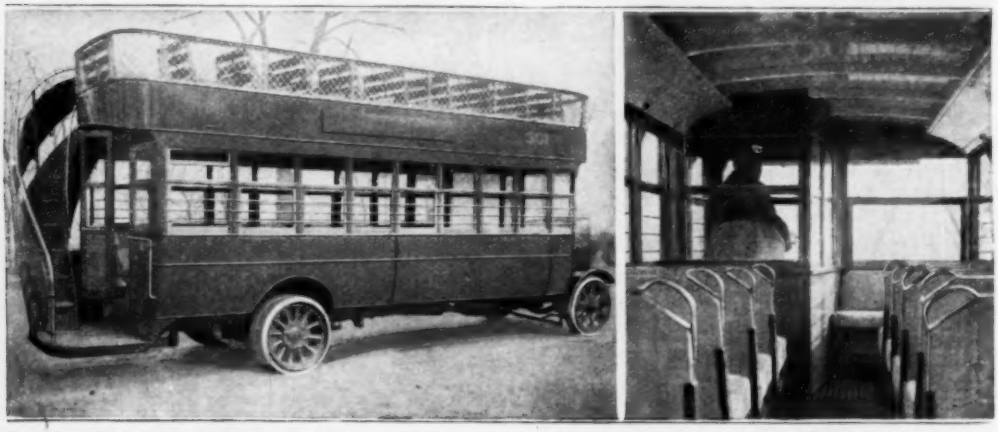
NEW MOTOR BUS FOR CHICAGO NEARLY EQUALS STREET CAR

That the motor bus as a means of transportation has met with popular favor, is evidenced by the development that has been made in the busses during the last few years. Recently the first of a new type has been placed in operation in Chicago which approximates the size and carrying capacity of the ordinary street car. This bus is of the double-deck type and will accommodate more than 60 passengers, is equipped with comfortable seats, and has a separate inclosed compartment for the driver. The open upper deck is reached by an outside stairway.

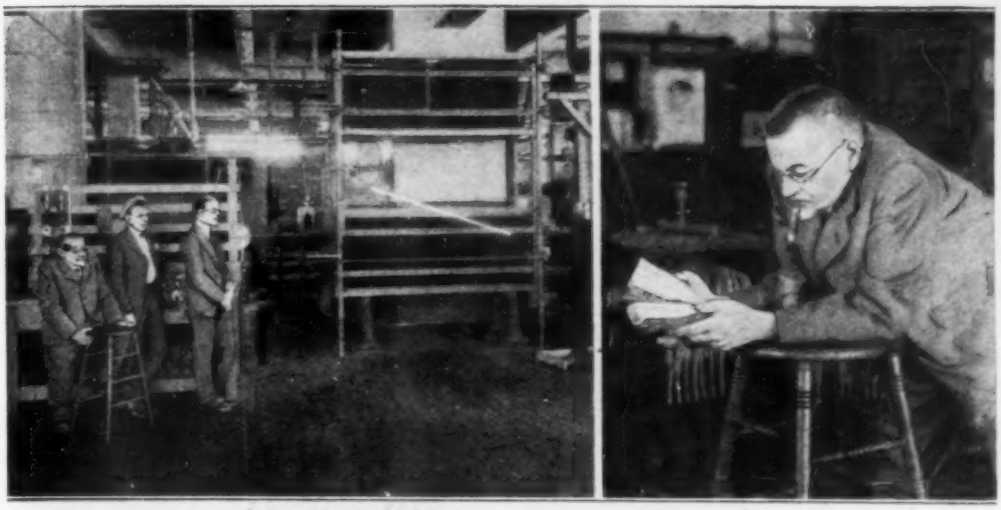
MACHINE FOR WALL PAPERING HOLDS PASTE AND PAPER

Papering a room is a sticky task for the novice, who usually smears everything within reach with the gummy paste, including his own irate person, and ruins several rolls of paper before the job is completed. A remedy for this has been produced in a machine having containers for the paste and paper, and a pressing or smoothing brush. The machine can be operated with one hand, the paste being automatically applied to the paper, which is "brushed" as the apparatus is drawn down the wall.

¶There are more than 1,200 small irrigation and water-supply projects either completed or under construction in Alberta and Saskatchewan, Canada.



The New Motor Busses Placed in Service in Chicago Are Much Larger Than the Older Ones, Being, in Fact, Almost as Large as Street Cars, Which They Resemble with Their Comfortable Seats and Inclosed Compartment for the Driver. The Entrance Platform at the Rear is Placed Conveniently Low



Left: Part of Equipment Used to Produce Artificial Lightning Bolt, Which can be Seen in Front of the Condenser-Generator. Right: Doctor Steinmetz Examining Wood Fragments Shattered by Imitation Lightning

ARTIFICIAL LIGHTNING BOLT REALISTICALLY PRODUCED

Artificial lightning bolts which perform exactly the same as nature's shattering strokes, although on a miniature scale, have been produced by Dr. Charles P. Steinmetz and associate engineers of the General Electric Company. The amount of power expended in each demonstration totaled more than 1,000,000 hp., obtained by the generation of 10,000 amperes at 120,000 volts. The apparatus used consists essentially of a high-voltage condenser of large capacity, in the form of 200 glass plates which are arranged in groups of 50, and in two rows, or banks. Rectified direct current is stored in these condensers, one end representing the thunder cloud in the sky, in which an electric charge is gradually accumulating to its capacity, and the other end corresponding to the earth. When the tension of the stored energy becomes greater than the condenser will hold (120,000 volts, at 10,000 amperes), a flash to the "earth" end results, thus imitating a discharge of lightning to the ground. By placing pieces of wood or other articles in the path of this powerful flash, or discharge, the tearing, explosive effects of genuine lightning were realistically produced.

¶As a means of protection for women traveling alone. A Canadian Pacific-coast steamship company furnishes each with a small ribbon which indicates by its color to what province she is traveling.

SNAP GAUGE THAT MEASURES ERRORS IN SIZE EXACTLY

A new type of gauge that does the work of a "go" and "no go" snap gauge, but which has a scale graduated to .0001 in. that shows exactly how much a piece of work is over or under the nominal size, is now in use in England. The instrument is shaped like an ordinary snap gauge, and has a movable plunger in one jaw which, through a system of boxed-in levers, operates a pointer on a scale, like the pointer of an ammeter or voltmeter. On a standard piece of work that is of the exact nominal size, the gauge is adjusted so that the pointer is at zero. In testing other similar pieces of work, any variation under or over size is then shown on the scale.

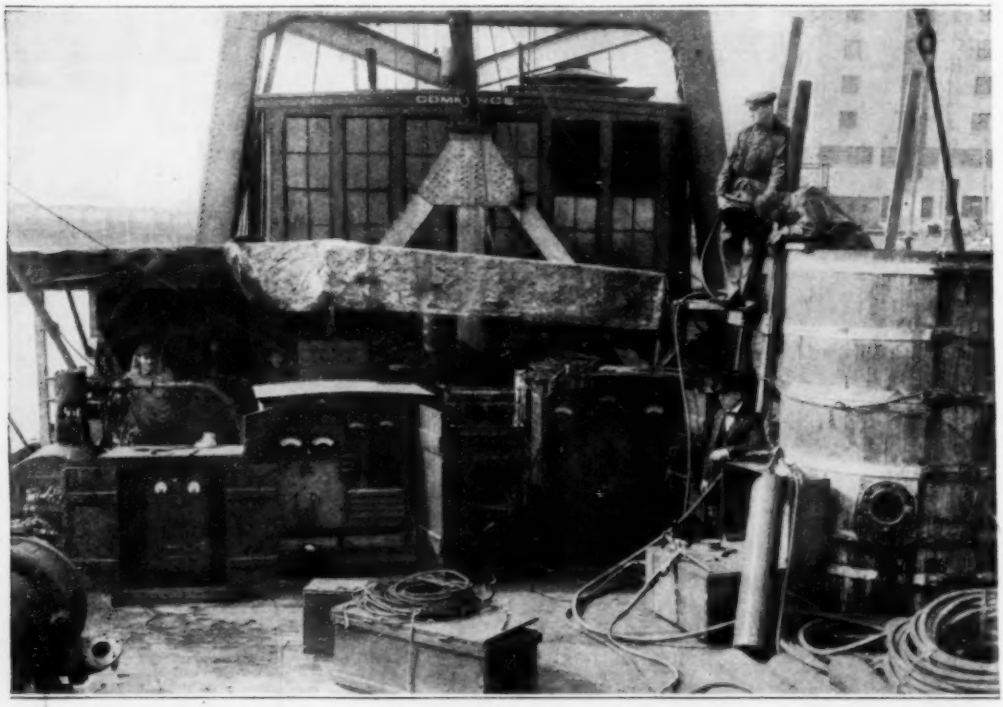
Gauge That Shows, with a Pointer on a Scale Graduated to .0001 Inch, Exactly How Much a Piece of Work Is over or under Size

TORCH CUTS CAST IRON IN FIFTY FEET OF WATER

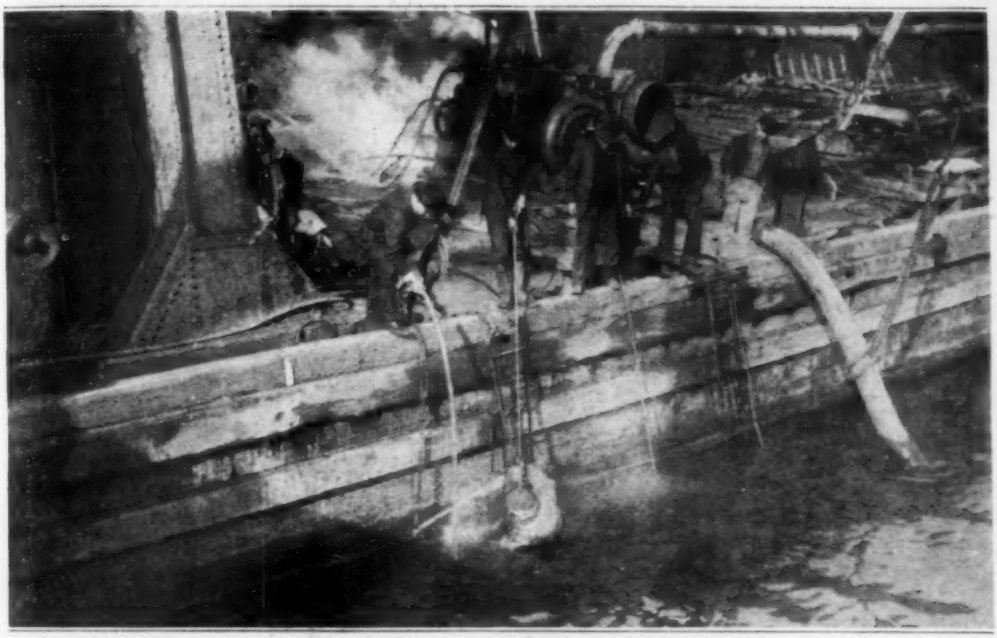
By A. M. HOFFMANN

WE have become accustomed to the idea of cutting metal under water by burning it, although at first this seemed like an impossibility. Both acetylene and electric torches have been so used for cutting steel plate, but usually at rather shallow depths. Now, by the use of a special electric cutting torch, a wrecking company has been able to cut cast iron—which is much harder to cut by burning than steel—at a depth of 50 ft. under water. Mention of this is also made in an article appearing on page 745, which had already gone to press before these further interesting details had been received.

Early in February, a dredge accidentally smashed a hole in one of the many 12-ft. sections of which this main is composed. As this pipe line supplies Staten Island with water, it was imperative that service be restored as quickly as possible. This was accomplished in record time by the aid of a gas-electric underwater cutting torch, an American invention promising to have a wide field of usefulness.



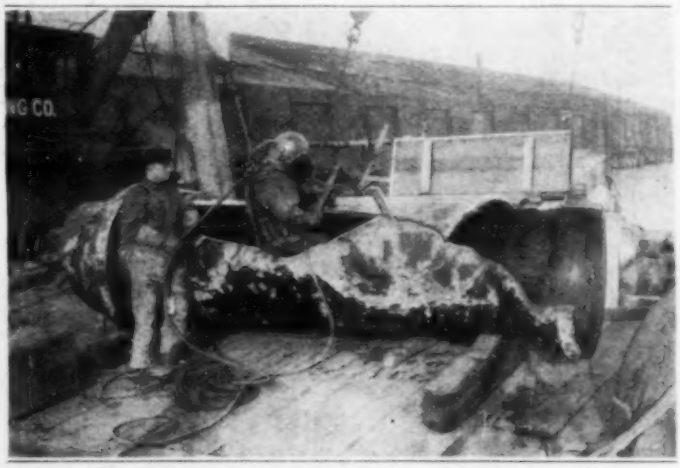
Above: Bringing Up the Broken Length of Pipe Which was Cut Out of Water-Supply Line with the New Type of Submarine Torch. Below: The Assembled Plant Used in Operating the Submarine Torch. The Tank at the Right was Used for Training the Divers for This Work and for Testing the Torch



The Diver, without His Helmet, is Demonstrating the Action of the Torch Just below the Surface of the Water. The Gas is Supplied to the Torch through a Flexible Hose Which Also Carries the Electric Wires Furnishing the Current for the Electric Arc with Which the Cutting is Done. The Torch can be Taken under the Water Unlighted and the Gas and Electric Current Turned On When the Diver Is Ready to Begin Cutting

The submarine cutting torch is a very ingenious and simple tool, that first came into use some years ago, and which makes use of the electric arc in conjunction with a gas. The arc is relied upon to do the cutting, while the gas creates a gaseous envelope in which the arc burns. The pressure of this gas is regulated to suit the depth at which the torch is employed. Both the current and the gas are fed from the surface, and the hose that supplies the gas also carries the electric conductor.

On the job, the diver takes the submarine torch down with him unlighted. When he reaches his goal he signals his attendant to turn on the current. In order to make the tool operate, it is only required to hold it a fraction of an inch away from the metal that is to be cut, and instantly the spark jumps the gap and arcking begins. This arc burns away the metal in the same manner as when it is used in the air.



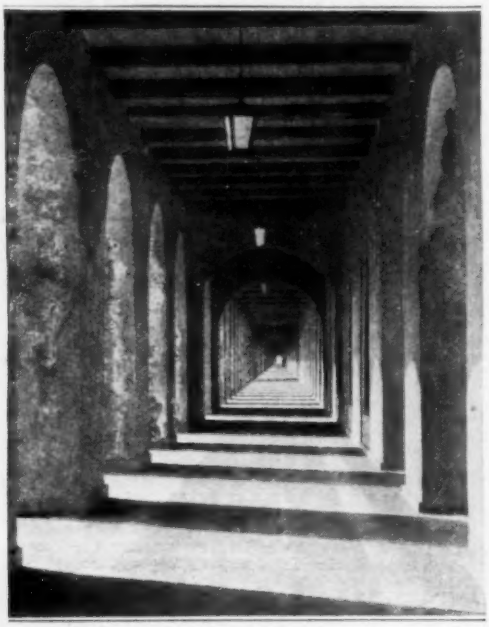
The Broken Pipe on the Dock: The Diver is Showing How the Submarine Torch was Used in Cutting the Pipe at the Bottom of the Harbor, Where the Divers Worked in Two-Hour Shifts Because of the Cold Water

GAS-FILLED TOY BALLOONS DECLARED FIRE MENACE

Toy balloons will no longer be permitted at public gatherings in Detroit, according to the city fire marshal of that place. Severe accidents, and in some cases fires, have resulted from the ignition of hydrogen-filled playthings by a lighted cigar or cigarette.

LONG SERIES OF ARCHES AFFORD STUDY IN PERSPECTIVE

The arcade connecting the new buildings of the recently built Marine Bar-

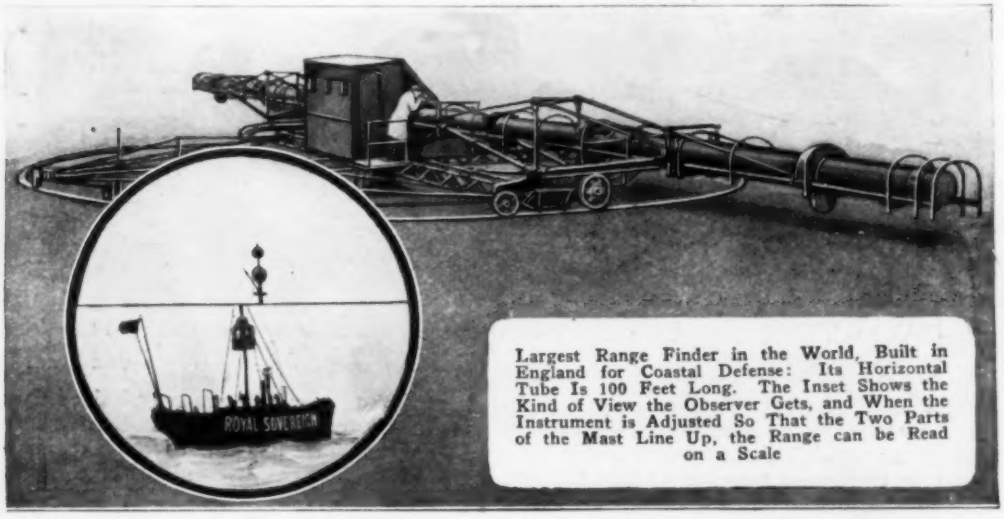


View from One End of a Series of Arches Forming an Arcade 3,000 Feet Long, Which Shows Perspectively the Other End Converged Almost to a Pin Point

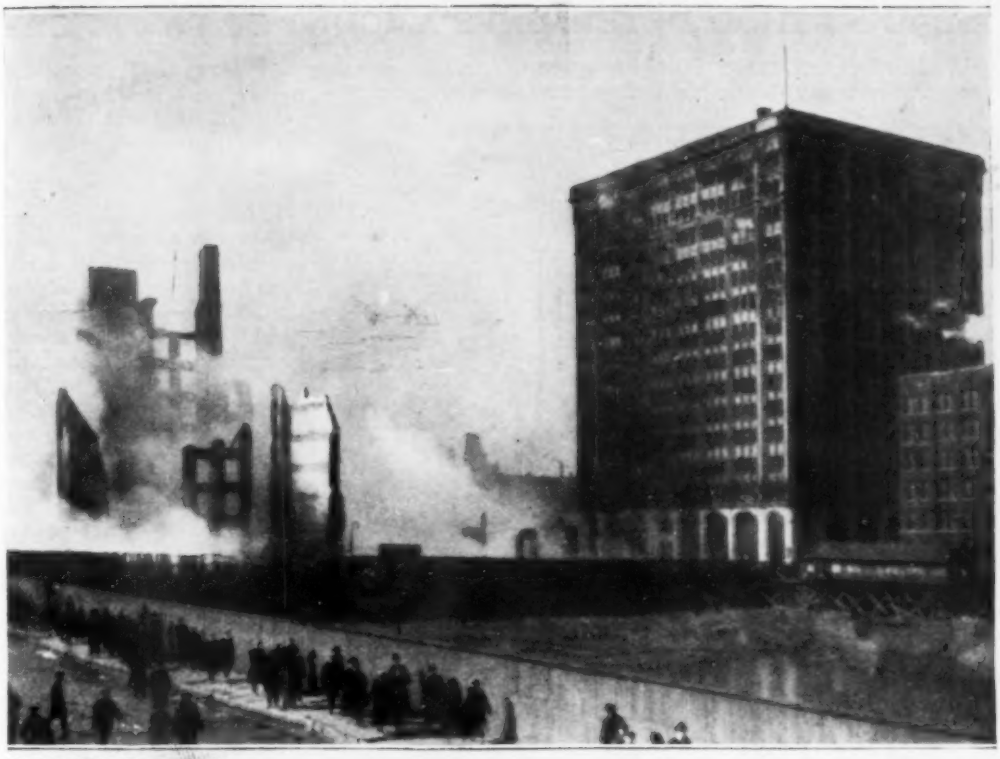
racks, San Diego, Calif., is over a half mile long—3,000 ft. to be exact. The arcade and buildings are built in mission style, with concrete archways, rough stone floors, and beamed ceilings. The perspective shows lines converging almost to the vanishing point.

HUGE BRITISH RANGE FINDER WITH RANGE OF 22 MILES

The largest range finder in the world, over twice the size of any used during the war, has been constructed in England for use in coastal defense. It was designed by the two original inventors of the range finder that has been in use in the British navy for many years, and that consists of a horizontal tube carried on a central frame, which rotates with the tube on a pedestal. In using the range finder, it is necessary to be able to rotate this tube horizontally, and for that purpose, in this huge instrument, there is provided a circular track of large diameter, with the supporting frame as its center, from which radiate connections to trolley wheels that run on the track. At the observing point, beside the pedestal, there are two telescopes in the tube, and in finding the range the observer places his eyes to the eyepieces, and sees a different field with each eye. That presented to the left eye is used as a finder for correctly alining the instrument. Then the object, as for instance a ship the distance of which is to be found, will be seen with the right eye as two images separated by a thin, black horizontal line. In the case of the ship, these images might be parts of a mast. When the instrument is adjusted so that these two objects assume their proper relative positions, the distance, or range, can be read from a scale provided for the purpose. In this huge range finder the tube is 100 ft. long, and distances up to 22 miles can be measured. In the range finders of the U. S. battleships this tube is 45 ft. long.



Largest Range Finder in the World, Built in England for Coastal Defense: Its Horizontal Tube Is 100 Feet Long. The Inset Shows the Kind of View the Observer Gets, and When the Instrument is Adjusted So That the Two Parts of the Mast Line Up, the Range can be Read on a Scale



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MOST MENACING CHICAGO BLAZE SINCE THE GREAT FIRE

WHEN one whole city block and a portion of another in Chicago burned recently, it was characterized as the most menacing conflagration since the great Chicago fire. The 16-story Burlington Building was completely gutted above the eighth floor and was damaged by water below that level, but was probably the means of saving much property situated to the west of it. While severely damaged itself, it acted as a fire wall in preventing the spread of the flames to adjoining property.

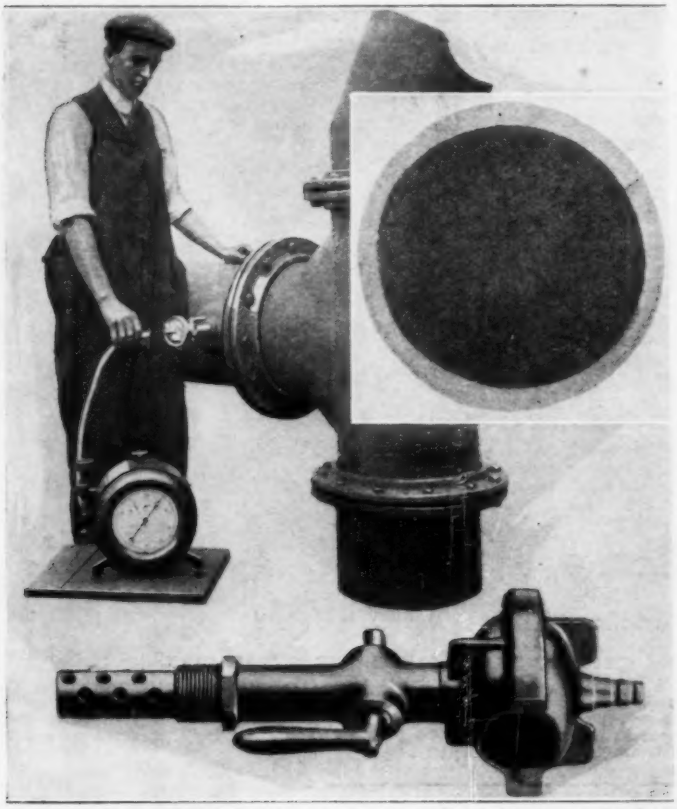
SMALL TRACTOR USABLE FOR VARIOUS PURPOSES

Various operations can be performed by a small tractor lately produced by an eastern inventor, the most prominent of these being weeding or hoeing the garden, or pulling a number of lawn mowers. Steering is accomplished with control handles, similar to those of a plow, which extend back to the driver's seat. In turning, one front wheel is thrown out of gear and the other turns the machine, with the stationary wheel as a pivot. Being capable of executing such sharp turns, the outfit is valuable as a garden tractor, or for cutting the grass in an orchard, or on a golf course where trees, bushes, and obstructions of different kinds are found.

Small Tractor Pulling a Number of Lawn Mowers over the Fairway of a Golf Course: The Plowlike Steering Handles Form an Interesting Feature of the Machine

RAPID METHOD DETERMINES AMOUNT OF TAR IN GAS

When the gas stove fails to operate properly, it may be a sign that some trouble-causing substance has found its way into the mains and service pipes. One of the most troublesome impurities that the gas companies have to contend with is tar, and skilled chemists are employed to test the gas in an effort to keep this tar out of the mains. In order to provide a simple and rapid means of determining the amount of tar in the gas, an instrument has now been devised which has been nicknamed the "tar camera." By passing a measured quantity of gas through a filter paper it was found that the stain left by the tarry vapors varied with the amount of tar in the gas. By comparing this stain with a set of standard colors, it is a simple matter to determine the amount of tar in the sample of gas tested, and the weight of the material deposited on the paper can be found as a further check. The tar camera, while designed for use in gasworks, can also be used to determine the quantity of moisture or suspended solids in air.

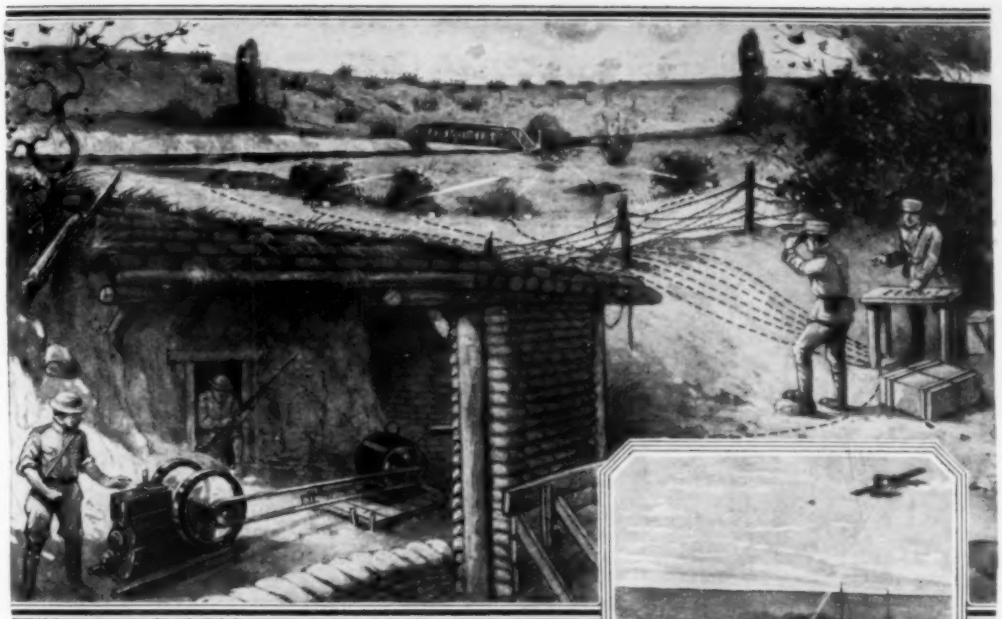


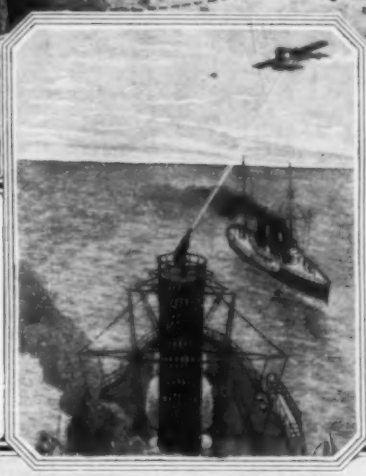
The "Tar Camera," Shown Below, is Screwed into the Gas Main and Connected to the Meter. The Valve is Opened and a Measured Quantity of Gas is Passed Through. The Vapor Stains the Filter Paper, Shown Above, and the Color Records the Amount of Tar in the Gas

POWER-DRIVEN MACHINE GUN UNDER DEVELOPMENT

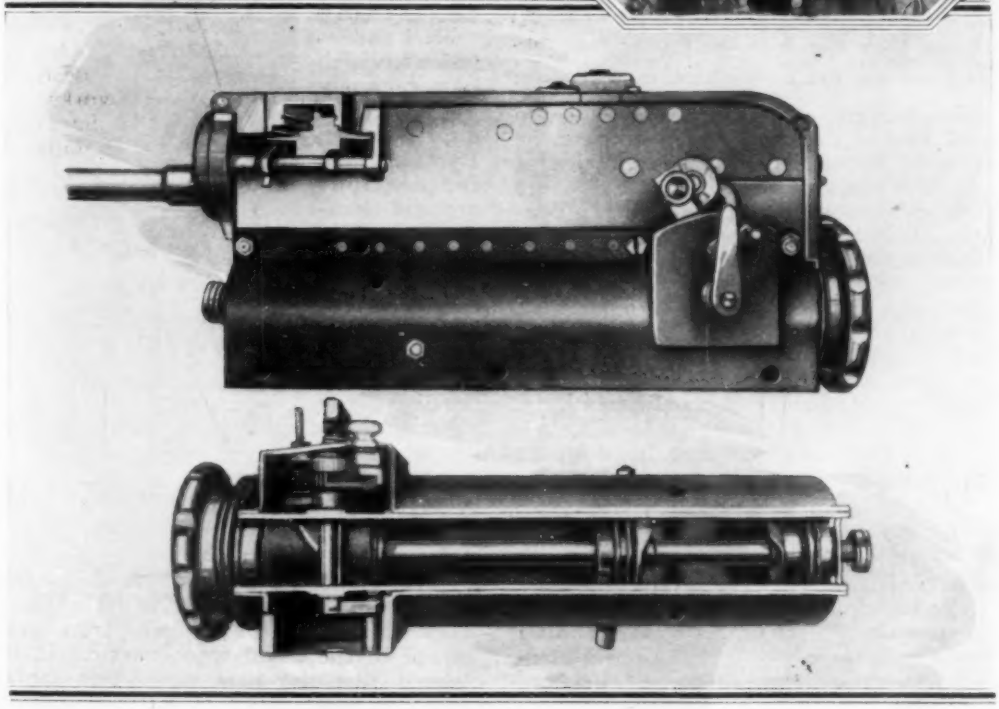
Remarkable possibilities are conceivable in connection with a power-driven machine gun, said to have originated in Germany, but which is now being developed in this country. Besides having several advantages over other machine guns, it is, or rather will be when it is fully developed, driven entirely by external power, such as an electric motor, or a gasoline engine. It has a driving shaft in the breech of the gun that operates the firing mechanism, and can be run in either direction, and at very low or very high speed. It does away with troubles due to bad and variable ammunition, and it reduces the amount of gas reaching the breech mechanism. It is fed automatically with ammunition on a cartridge belt similar to those used commonly in machine guns. In other details it will also resemble existing machine guns, such as its water jacketing of the gun barrel, and it may be mounted on a tripod. Up to the present, it has only been developed for the purpose of demonstrating by hand the operating mechanism. Later on the handwheel, with which it is now driven, will be replaced by a sprocket, which will be driven by a chain from a motor.

¶Unbreakable glass, which can be heated red-hot and placed in cold water without any perceptible effect, is said to have been produced in Bohemia after years of experiment. Hammers made from the product can be used for ordinary purposes.



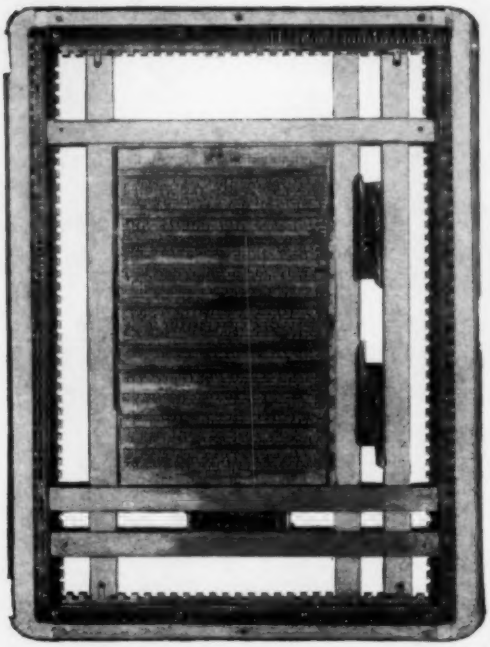


Power-Driven Machine Guns Shown Above Defending a River Crossing against an Assault of the Enemy: Batteries of the Guns in Emplacements are Operated by the Gunners from a Safe Distance in the Rear. Sheltered Power Station in the Foreground is Connected to Operating Base, Which by Wire Connections to the Guns Has Them under Complete Control. To the Right, One of These Guns is Shown on a Battleship's Conning Tower Doing Anti-Aircraft Work. Below: Side Elevation and Bottom View of Operating Gunbreech in Experimental Gun, Built with Handwheel at Rear, Where Driving Sprocket would Be, and Showing Aperture for Cartridge Belt in Front of the Breech. The Water Jacket on the Barrel is Not Shown



PRINTERS' CHASE SIMPLIFIES LOCKING UP FORMS

Time, labor, and material are saved in a newly patented printers' chase, which dispenses with the use of the usual printers' furniture cabinet, and eliminates



Printers' Chase That, in Locking Up Any Form, Dispenses with the Use of Printers' Furniture: Where the Quoins Are, One Bar is Locked, the Other Loose

roller bearers, as these are fitted onto each end of the chase itself, and can be removed by means of screws. Inside of the four sides of the chase are grooves that accommodate pica notches. In connection with these are bars that stretch from side to side, and end to end, of the chase, and can be moved into any position, and locked there automatically. Some of these bars are double, one being locked and the other loose, so that printers' quoins can be placed between them, and the loose bar be pressed against the type form. These bars are made of nickel-chrome steel and will not bend under severe strain.

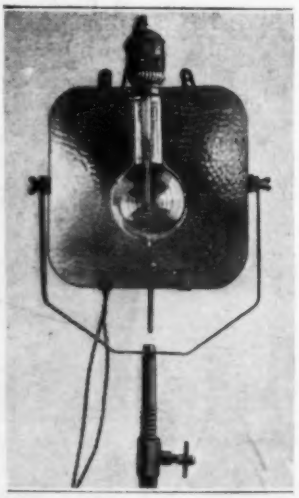
LARD OIL AS A LUBRICANT VINDICATED BY SCIENCE

The belief of machinists that lard oil is superior to mineral oils in certain cutting operations, as on a lathe, has been regarded by many as a superstition. Studies of the subject made at the Bureau of Standards, the results of which have just been announced, show that the machinist is right and that lard oil is distinctly better for many purposes than mineral oil, in fact being well-nigh indispensable in certain cases. The need for lard oil has been previously discredited, as it was thought that the viscosity of the oil determined its behavior with cutting tools, and mineral oils, or mixtures of mineral oils, could be obtained with the same viscosity as lard oil.

It now appears that the lard oil has, aside from viscosity, the important characteristic of adhering more tenaciously to the metal than mineral oils, thereby preventing the tool from seizing the metal of the work, and causing it to drag and tear and make a rough cut. Lard oil is very useful in getting good clean surfaces in cutting soft steel and wrought iron, and also in tapping and threading. However, in hard brittle steel lard oil merely produces a glaze, and turpentine is used with success.

BRILLIANT LIGHT OBTAINED WITH NEW REFLECTOR

Brilliant lighting effects can be obtained with the use of a new reflector having a concave silvered surface containing special indentations, which has recently been introduced in France. These indentations are said to increase greatly the efficiency of any lamp used, which, in public buildings or photographic studios, results in a high illumination at a comparatively low cost in the consumption of the electric current.

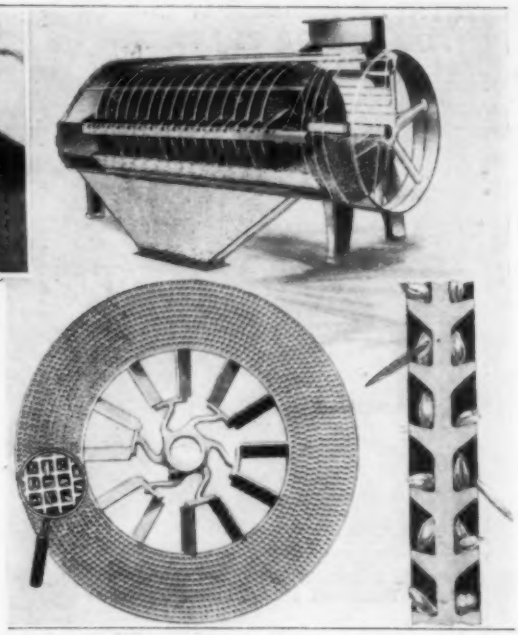


¶It is reported that concrete ships are now being experimentally built in Germany with the use of a floating iron shell instead of the usual wooden one. It is claimed that the new method is more rapid and less costly.

The Wheat-Cleaning Machine Is Light Enough to be Placed on Top of the Threshing Machine, and the Grain is Cleaned Before It is Shipped

MACHINE WILL CLEAN WHEAT AT TIME OF THRESHING

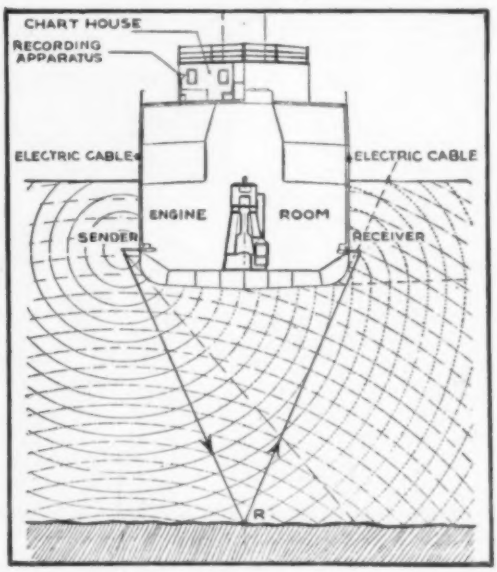
One source of economic waste has been the contamination of wheat by dirt and the seeds of various weeds and foreign grain, such as wild oats, buckwheat, and many others. Lately a machine has been designed and tested which seems to point to the solution of the problem of cleaning wheat at the time of threshing. It is of simple construction and can be placed on the top of the threshing machine, receiving its power from that source. In operation, the grain is fed into a horizontal cylinder in which are revolving disks provided with undercut pockets of such size that the dirt and foreign seeds are discharged at one point, while the cleaned wheat is discharged at another point. It is claimed that the separation is very satisfactory.



Above: A Phantom View of the Machine, Showing How the Disks Revolve in the Grain. Below: Enlarged View of the Disks, Showing the Arms Which Move the Grain Ahead and Pockets Which Deliver It at the Proper Place

EMPLOY ECHO FOR MEASURING THE DEPTH OF THE OCEAN

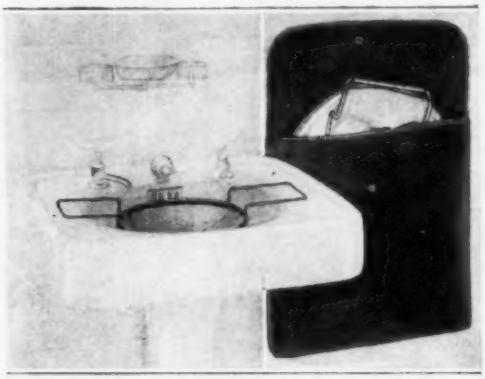
The Navy Department has been working on a device for measuring ocean depths by means of reflected sound waves, but as yet has not perfected it to a point where it wishes to give out information regarding it. A recent German device of similar nature has been developed, by means of which depth measurements, accurate to within one foot, can be made even when the ship is moving at full speed. The principle, which has been applied previously, is very simple. A sound is made on the ship, the sound waves travel to the bottom of the ocean and are then reflected back to the ship. Sound travels in water at the rate of about 4,700 ft. per second, so all that is necessary is a suitable sending and receiving instrument with a means of measuring the time it takes for the sound to go and come back. The German apparatus is capable of recording a difference of $\frac{1}{5,000}$ part of a second. The apparatus is tuned in such a way that the usual noises and vibrations of the ship in motion do not interfere with its operation.



When the Captain Wishes to Take a Sounding He Causes a Cartridge to be Fired at the Sending Instrument and Notes the Time It Takes for the Sound to Reach the Receiving Instrument. The Interval of Time Required for the Sound to Return Measures the Depth of the Water under the Ship

PORTABLE RUBBER WASHBOWL FOR USE OF TRAVELERS

Insanitary conditions of hotel washbowls have caused the introduction of a portable bowl consisting of rubberized hospital sheeting. The material is pinched between two metal loops, as linen is held in the rings of an embroidery frame. A telescopic frame enables the innovation to be fitted in any ordinary washbowl, and when not in use, it can be folded in a small flat leather case.



Left: Portable Rubber Washbowl on Hotel Washstand. Right: Washbowl Folded in Leather Case

FRANCE PREPARES WONDERFUL TAPESTRY FOR AMERICA

For the purpose of commemorating America's entry into the great war and of further showing her appreciation of the assistance rendered, France is causing to be made a great tapestry which is to be presented to the United States. The tapestry shows in large figures the departure of American soldiers for France, and is wonderfully complete in details and coloring. In making the tapestry, the weavers are aided by sets of mirrors, one of which reflects all the details of the large painting which hangs behind the weavers, while another enables the workers to watch the results as the weaving proceeds.

GERMAN AUTOMOBILE SHAPED LIKE A RAINDROP

Radical departures in automobile design have apparently not yet reached their limit, judging from a striking example of novelty presented by a car that caused a sensation at a recent auto show at Berlin, Germany. The principal aim of the designer was to construct a car with streamlines that would offer the least possible resistance to the air, and for that reason a falling raindrop was taken as an ideal model. Everything in the construction of the car was made subsidiary to this, and incidentally involved many striking novelties. The chassis is made of two wide pieces of pressed steel, under part of which there is a streamlined bottom of thin metal. The body, in both the open and limousine types, follows strictly the raindrop pattern. In both cases the driver sits in front and the passengers behind, all the seats being in the center of the car between the two axles. The motor is at the back of the car just in front of the rear axle, and consists of six cylinders in three pairs, arranged radially, with the central pair vertical and the others at 60°. Normally it develops only 10 hp.—all that is required to drive the car as a result of its slight air resistance. Behind the motor, in line with the rear axle, is the radiator, which is cooled by a powerful fan. The center of gravity of the car is very low, and it rides quite steadily with a chauffeur and two passengers, even at such a high speed as 75 miles an hour, recently attained on a race track.

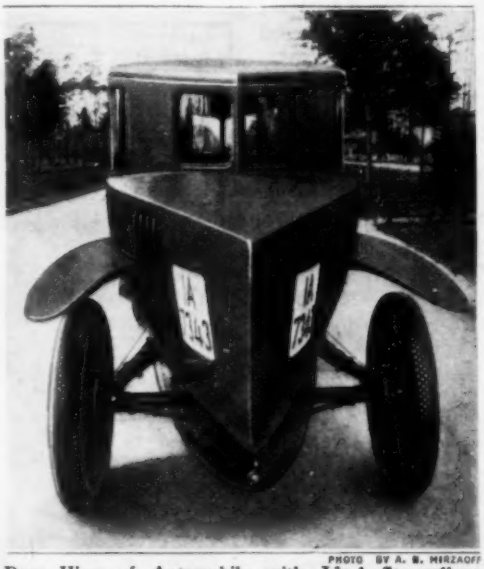
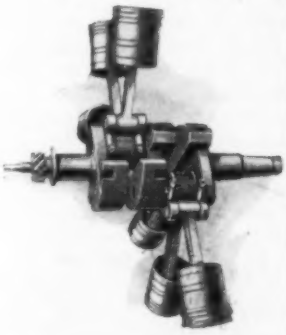


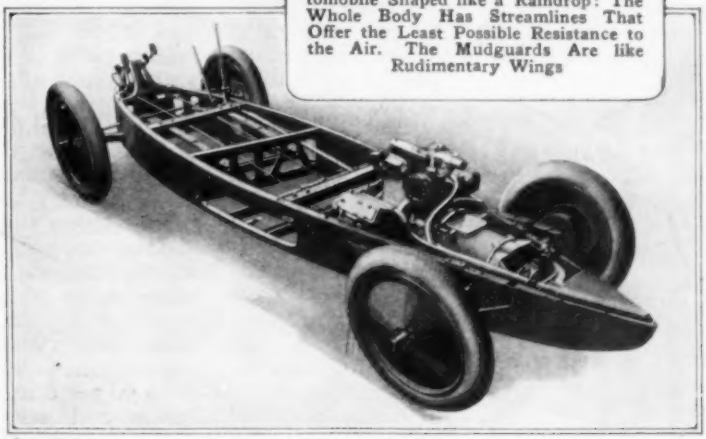
PHOTO BY A. B. MIRZAOFF

Rear View of Automobile with Ideal Streamlines, Shaped like a Raindrop: The Motor is Located near the Rear Axle Where Ventilator Openings are Seen

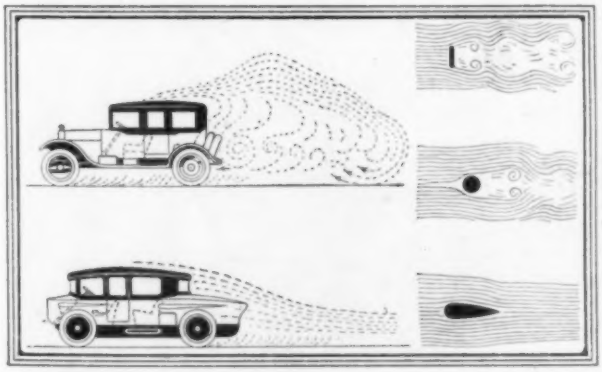
Side View of Limousine Type of Automobile Shaped like a Raindrop: The Whole Body Has Streamlines That Offer the Least Possible Resistance to the Air. The Mudguards Are like Rudimentary Wings



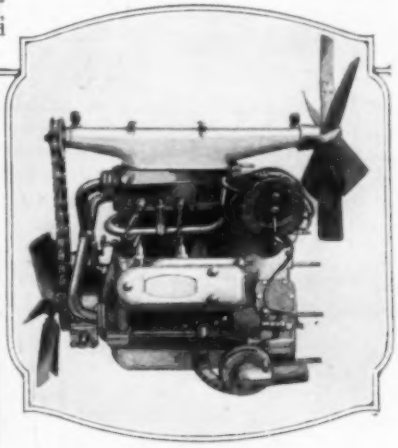
Crankshaft and Pistons of the Six-Cylinder Engine Built with Two Cylinders Vertical, and Two at 60 Degrees on Either Side of Them



Streamlined Chassis with the Motor and Its Driving Equipment at the Rear Axle, and the Controlling Pedals and Levers Seen at the Front, Where the Driver's Seat is Located

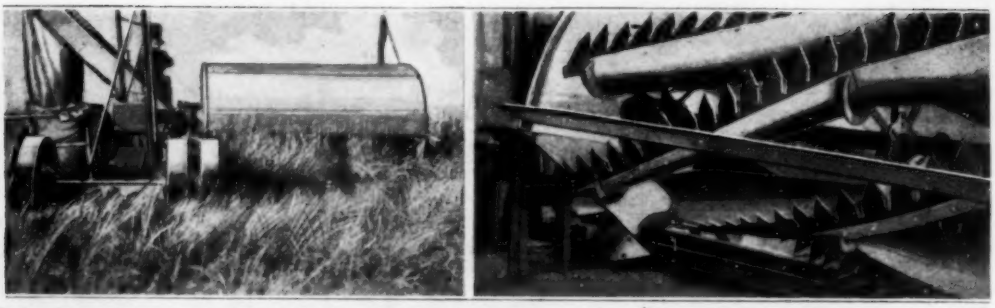


Reaction of the Air to the Ordinary Car, and to the Car Shaped like a Raindrop: The Former, in Upper View, Causes Eddies like the Disk or Ball at Right, While the Latter Disturbs the Air No More than the Raindrop at the Right



Power Plant of Raindrop Car on Rear Axle with Six-Cylinder Motor at Left and Radiator at Right, Which is Cooled by a Powerful Fan

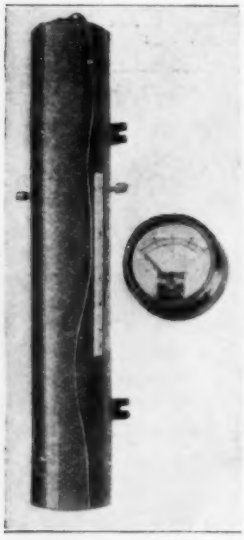
PHOTOS BY A. N. MIRZAOFF



Left: Front View of the Rice-Stripping Machine in Action, Showing How It is Pulled through the Rice Field by a Tractor. Right: Construction of the Stripping Teeth on the Cylinder of the Machine

FLASH-TIMING ARRANGEMENT FOR MAKING RADIOGRAPHS

Instantaneous radiographs, or X-ray pictures, can be made with a new flash-timing apparatus which has a range of from 1/10 to 1/7 second. The instrument consists of a hollow cylinder having a weight inside, which makes and breaks an electrical contact according to the way a small indicator is placed on the outside scale. After the indicator is adjusted on the scale for the desired time of exposure, the weight is pulled up toward the top of the cylinder, until at a certain point it is automatically released. As the falling weight passes the indicator, a contact is made which opens a shutter for the exposure, and when the weight strikes the bottom of the cylinder, the shutter is closed.



HARVESTER COLLECTS RICE FROM STANDING STALKS

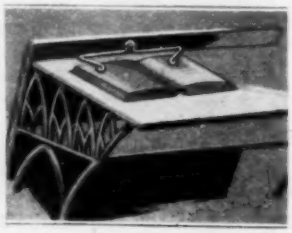
A rice-stripping machine has been developed that marks a decided advance in the harvesting of rice. This machine strips off the rice while it is standing in the field, leaving the stalk and taking only the grain. This makes unnecessary cutting and threshing, which are the most expensive of the rice-harvesting operations. This stripper is equipped with a cylinder with six bars, on which are mounted fingers, or teeth, of the proper shape for stripping the rice. Revolving as it moves along, the teeth of the stripper comb the rice from the straw and throw it up over the cylinder in the hood and drop it into a trough.

The grain is then conveyed by an elevator across to a platform, where the elevator empties it into sacks, which are tied, dropped off in piles, and finally picked up and hauled to the granary. This leaves the straw standing in the fields to be plowed under and used as fertilizer for the next year's crop.

This stripper, being mounted on, and attached to, one of the regular harvesting tractors, is able to work successfully in any rice field. When the rice comes from the stripper, it is from 60 to 80 per cent threshed clean off the stem; the other 20 to 40 per cent consists of blades, whole heads, and part heads that have been jerked off with the rice grains still intact. This rice must be carried through some cleaning process to get it ready for the granary or for the market.

SIMPLE BOOKHOLDER MADE BY BENDING IRON WIRE

Bending a piece of iron wire to make a simple bookholder is the idea of an Indiana inventor. The holder consists of a wire with an eye bent in the center for a screw, and with two arms bent at right angles to rest upon the book. The whole arrangement is screwed to the back of the school-desk upright, and the tension of the wire holds the arms flat against the pages. The device is patented.



STEAM TOURING CAR SIMILAR IN FORM TO GASOLINE CAR

Past experience with steam cars has shown that, while some would operate as economically, it has been difficult to manufacture them at as low a first cost as equivalent gasoline-engine cars. Built in many respects on the lines of a gasoline car, there is now being constructed a commodious steam touring car which the manufacturers expect to be able to market for about $1,000. Viewed externally, it is difficult to distinguish it from any ordinary gasoline car. The hood is exactly similar, with what appears to be an ordinary radiator, but is, as a matter of fact, the condenser for the exhaust steam from the engine. Immediately behind this is the boiler, which supplies superheated steam at a pressure of 600 lb. It operates intermittently, its fire box being a mixing chamber for air and kerosene forced into it by motor-driven pumps, and ignited by a spark plug, all of which are on an electric circuit, which is automatically broken when the pressure reaches 600 lb., and closed when it drops below that pressure, or by a switch operated by hand in starting. The engine—of the V-type—located behind the boiler, has three cylinders, one on one side, and two on the other, with poppet valves operated by cams. In combination with the engine is a two-speed and reverse transmission. Power is transmitted to the rear axle by the usual propeller shaft. At the driver's seat are gear-shift and emergency-brake levers, with a service-brake pedal, and another for controlling the steam cut-off. Directly below the steering wheel is the throttle for speed control. The weight of the car fully equipped is 2,250 pounds.

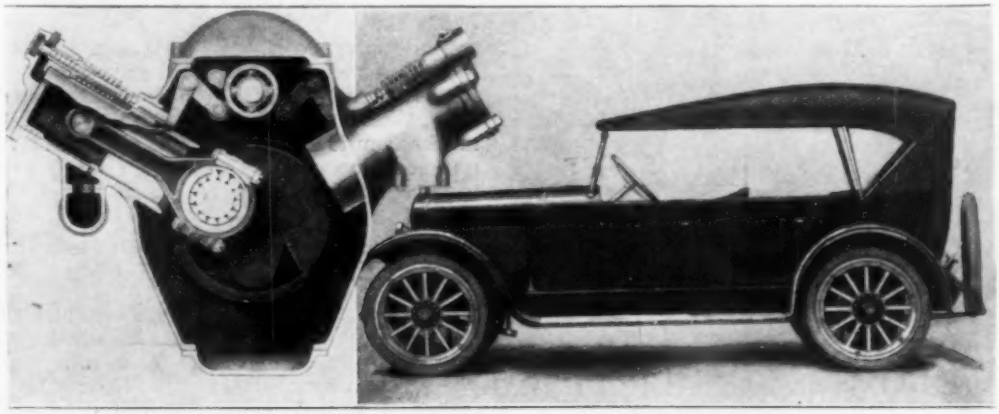
POLICEMEN IN EGYPT CARRY SHIELDS FOR PROTECTION

Broken bottles, stones, etc., are the favorite weapons of rioters in Egypt, and

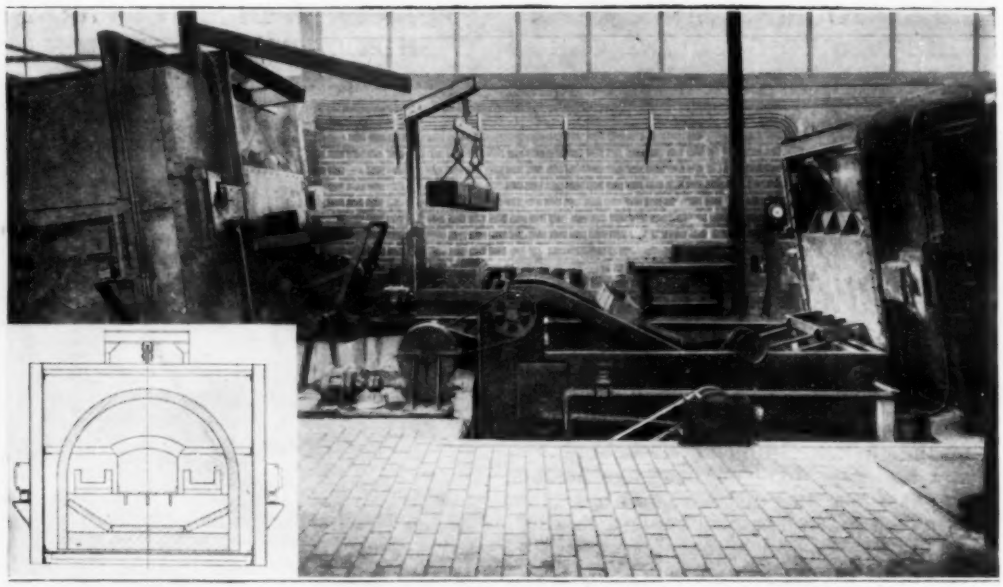
Left: Egyptian Policeman Ready for Action with Club and Shield. Right: Carrying Shield When Not in Use

to protect the police from these crude barrages, they have been furnished with shields. These are of woven-reed material, and when not employed in warding off flying missiles of a miscellaneous character, are carried on the back by the policemen.

¶Ghostly materializations of a Danish medium aroused such widespread interest that scientists of Stockholm, Sweden, decided to verify the performances. During a seance, when a "soul" was projected outside of a body, a photograph showed that the filmy emanation was nothing but a piece of chiffon.



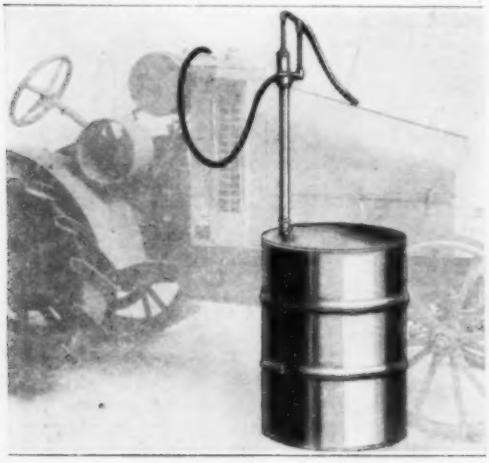
Steam Touring Car That Is Indistinguishable in Appearance from a Gasoline Car, and can be Manufactured Very Economically: What Looks like the Radiator Is the Steam Condenser, and under the Hood, besides the Boiler, Is the Three-Cylinder V-Type Engine, Shown to the Left on an Enlarged Scale



The Steel Parts Go, Automatically, through the Hardening Furnace at the Right, the Quenching Tank, in Center, and the Annealing Furnace at the Left. The Insert Shows the Interior Arrangement of the Furnace

ECONOMICAL FUEL PUMP FITS ANY BARREL OR DRUM

Farmers can have their own miniature filling station if use is made of a pump placed on the market by an Illinois concern. The pump is made entirely of brass, insuring durability, is adjustable to fit any size wooden or steel barrel, or drum, and has a capacity of 5 gal. per minute. Preventing the evaporation or spilling of the fuel, and eliminating all danger when filling the tanks of motor cars or tractors, are additional features of the product.



This Fuel Pump Fits Any Steel or Wooden Barrel, and Prevents Waste

AUTOMATIC ELECTRIC FURNACE FOR TREATING STEEL PARTS

It has long been known that the proper heat treatment of steel is a big factor in determining the strength and wearing qualities of the piece treated. This is of particular importance in the automobile industry. Up to date, heat treatment has been practiced in various kinds of furnaces, but always under the supervision of skilled operators equipped with the most delicate instruments for measuring time and temperature. Now, however, an automatic electric furnace, installed at a Michigan automobile plant, has been devised in which the parts to be treated move through the different processes on a predetermined schedule. The parts are loaded in metal baskets and pass through the hardening furnace to the quenching tank, thence to the drawing furnace. The mechanism is set so that the parts undergo each step of the treatment exactly the required period of time.

GREAT BRITAIN NOW ABANDONS DIRIGIBLE AIRSHIPS

It is announced that Great Britain is to scrap her aerial navy, as far as the large dirigibles are concerned. The action is partly the result of the desire for economy and partly because of the disasters to the two great airships, the "ZR-2" and the "Roma," with their consequent loss of

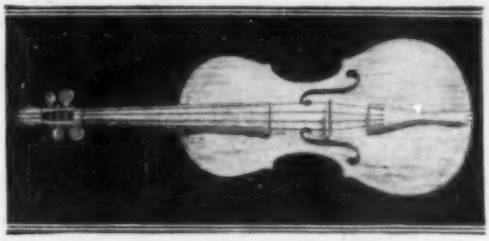
life. The equipment at the large airship bases is to be dismantled and sold at scrap prices. This action means the abandonment of plans to link up the empire aerially.

NEW TIE-CHANGING MACHINE RAPID AND ECONOMICAL

Replacing railroad ties reaches a yearly average of more than 10 per cent of the total number in the roadbed, and a machine has been developed that will do this work at a cost of .4 man-hour per tie, instead of the old rate of 1.2 man-hours. In operation, the apparatus is placed across the rails, and a ratchet arrangement with handles works back and forth upon it. Attached to the ratchet is an anchoring chain and also a steel pulling cable, the latter terminating in a special clamp which is fitted over the end of the tie. After the spikes and tieplates have been removed, the clamp is fastened on and the worn-out tie pulled from under the rails without disturbing the roadbed. Where there is but a single track, the new tie can be pulled in without moving the machine, but with a double-tracked right of way, it must be reversed so as to pull the tie in from the "ditch" side.

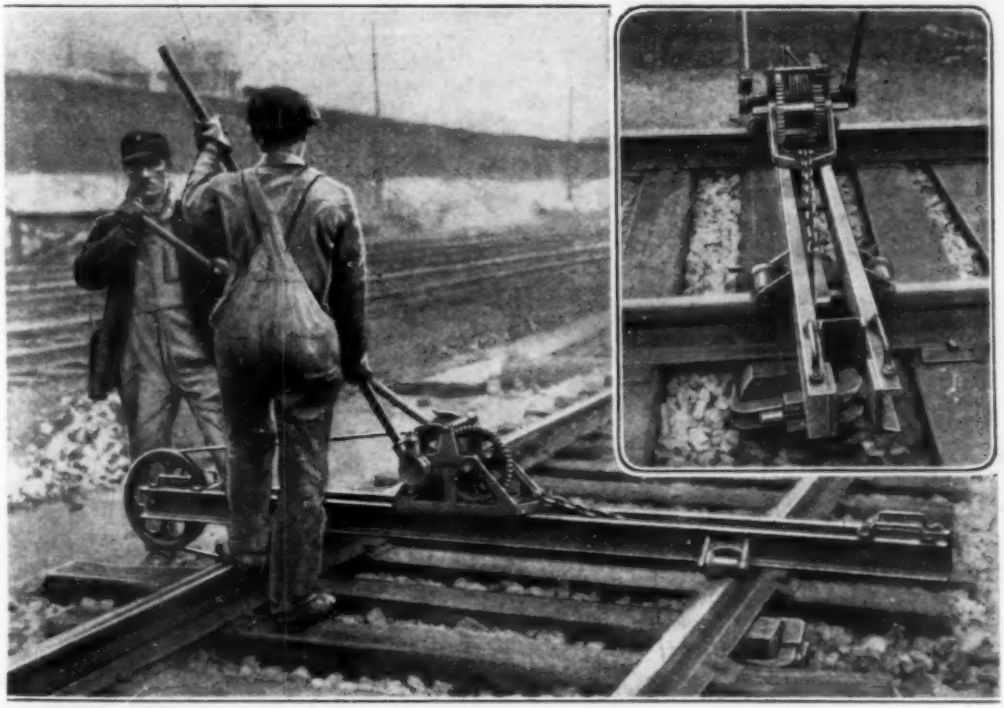
VIOLIN MADE OF MATCHES, TOOTHPICKS, AND GLUE

When a person speaks of violin making, it brings to mind thoughts of the finest wood, thoroughly seasoned, and carefully worked to the proper dimen-



This Violin is Composed of More Than 13,000 Matches and Toothpicks

sions. That this is not a necessity, is shown by a patient worker who has made a violin entirely out of matches and toothpicks glued together and fashioned to the proper thickness. In spite of the unusual material used in its construction, the violin has a soft mellow tone, said by experts to be of good quality and volume. It seems remarkable that a violin constructed in this way should stand the strain and vibration of being played upon.



Tie-Changing Machine, Showing the Ratchet Arrangement in the Center, the Pulling Cable at the Left, and the Special Clamp under the Right End of the Frame: The Inset Shows the Anchoring Chain

TYPEWRITER STUDENTS AIDED BY "FLASHBOARD" MACHINE

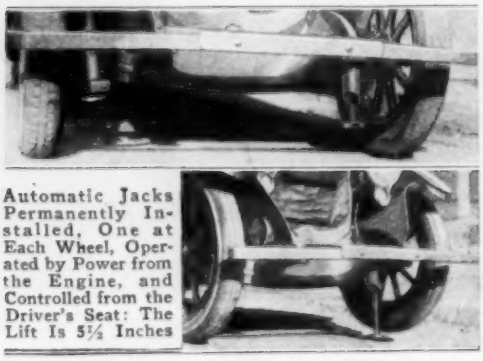
Typewriter students have been greatly aided by the introduction of a flash writing machine which furnishes an easy

Machine for Typewriter Students, Showing the "Blind" Standard Keyboard Below and the Lettered "Flashboard" at the Top with the Shutters

method of visualizing letters and words on a keyboard. The apparatus has a "blind" keyboard with the standard number of blank keys on it, and in place of the usual set of type, has what is called a "flashboard." This flashboard also is equipped with the standard layout of letters, signs, etc., each having a white spot under it, but which is concealed by a small shutter. When a key is struck, the shutter beneath the corresponding letter or sign is drawn down for an instant, exposing the white spot. The beginner thus forms a mental picture of the positions of the different letters and soon becomes adept in "seeing" entire words, all of which helps in the development of speed.

AUTOMATIC JACK CONTROLLED FROM AUTO DRIVER'S SEAT

With a new device consisting of four jacks permanently attachable to any car —one adjacent to each of the wheels— an automobile driver can jack up any one or all of the wheels without leaving his seat. The jacks are operated by power from the engine, transmitted either from the flywheel or the pump shaft. Four levers near the driver's seat furnish the means of control. The jacks have a maximum lift of 5½ in., and are powerful enough to lift any load that the car is capable of moving. Tire changing will thus be greatly facilitated, and the jacks will make it easy to take the load of the car off all the tires when not in use, thus greatly adding to their length of life.



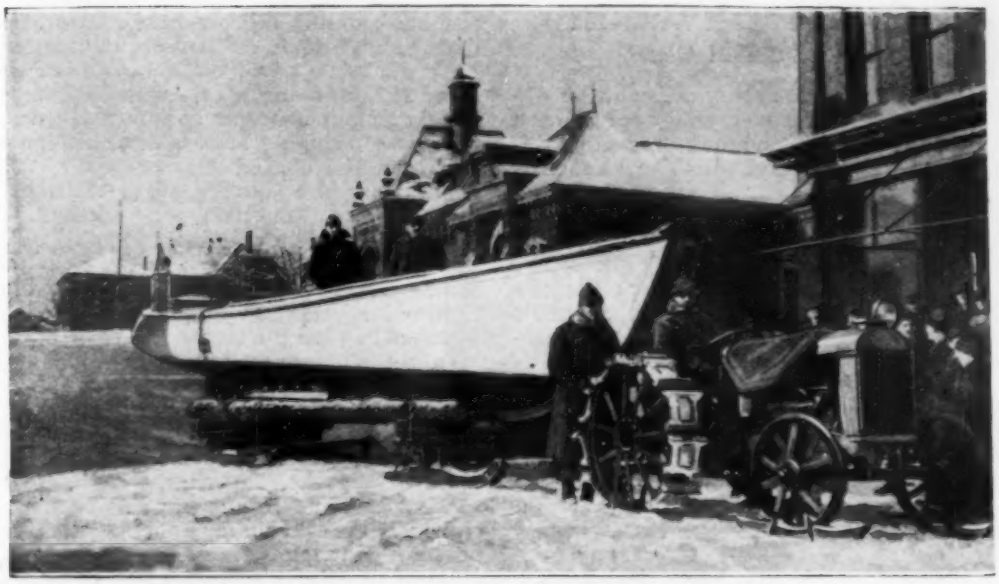
Automatic Jacks Permanently Installed, One at Each Wheel, Operated by Power from the Engine, and Controlled from the Driver's Seat: The Lift Is 5½ Inches

LAND ELEVATIONS OF NATION SHOWN IN WATCH CHARM

An unusual watch charm, which is representative of the extremes of land elevations within the continental limits of the United States, has been made by a western man. The charm consists of three pieces of polished stone picked up in California: one from Death Valley, symbolical of the lowest point below sea level; one from Redondo Beach, to represent sea level, and one from the summit of Mt. Whitney, being emblematic of the highest point of land. These are set in a gold mounting which bears an engraved description of the three layers of mineral, the whole serving as a pleasing reminder of the owner's visits to the different localities.

USE WEATHER CHART TO SAVE MONEY WHEN PLACING TIES

That rainfall charts may be used as money savers was recently shown by a railroad wishing to place ties it had on hand which had been treated with zinc-chloride preservative. The ties treated with this zinc salt are satisfactory in dry climates, so a map was prepared showing portions of the line where the rainfall was relatively small, and the ties were used at these points, while creosote-treated ties were used at points subject to heavier rainfall.

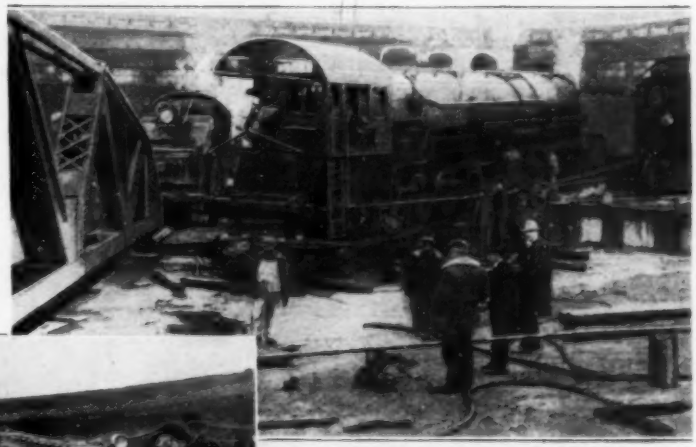


MOTORBOAT TRAVELS OVER SNOW-COVERED HIGHWAYS

BUFFETING through snowdrifts in a motorboat was the strange experience of three men who made a 70-mile trip over the highways to deliver the purchased craft to its owner. The boat, which was ordered built for pleasure purposes on a Maine lake, is 40 ft. long, 8 ft. 6 in. wide, 3 ft. 6 in. deep, has an oak frame with cedar planking, and weighs two tons. Two 24-hp. gasoline engines will drive two propellers, to yield a speed of 18 knots (20¾ miles an hour). In making the journey from the boat works to the buyer, the craft was mounted on ordinary bobsleds and pulled by a one-ton tractor.

WILD ENGINE MAKES PLUNGE INTO TURNTABLE PIT

Running wild, an engine in a roundhouse of the Southern Pacific Railroad steamed out of the building and plunged into the turntable pit, causing $1,750 damage. Men were working on other engines in the immediate vicinity, when suddenly the large locomotive was seen to move and gather headway, but with no one visible in the cab. After due investigation, the board of inquiry appointed by the company reported that an unknown person, or persons, had opened the throttle and started the engine on its disastrous journey.

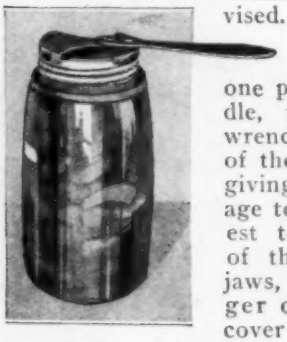


Workmen Raising the Runaway Engine upon Blocks Preparatory to Taking It Out of the Turntable Pit: The Damage to the Cab of the Engine can be Plainly Seen

Runaway Engine Shown in Turntable Pit Immediately After It had Made the Disastrous Plunge

NEW FRUIT-JAR WRENCH GIVES FIRM GRIP

Anyone who has struggled with an obstinate fruit-jar cover will appreciate a wrench recently devised. The wrench is so constructed that the harder one pulls on the handle, the tighter the wrench grips the top of the jar, the handle giving sufficient leverage to start the tightest top but, because of the shape of the jaws, there is no danger of spoiling the cover or the jar. The wrench is made of stamped metal and combines lightness and strength.



CHALLENGER IN FISHING-BOAT RACE IS LAUNCHED

The American fishing schooner "Puritan," prospective challenger for the international trophy won by the Nova Scotian craft "Bluenose" in a contest last fall against the "Elsie" of Gloucester, Mass., was launched on March 15 at Essex, Mass. More than 1,000 persons witnessed the launching, despite the fact that the shipyards in which the schooner was built are in a remote community.

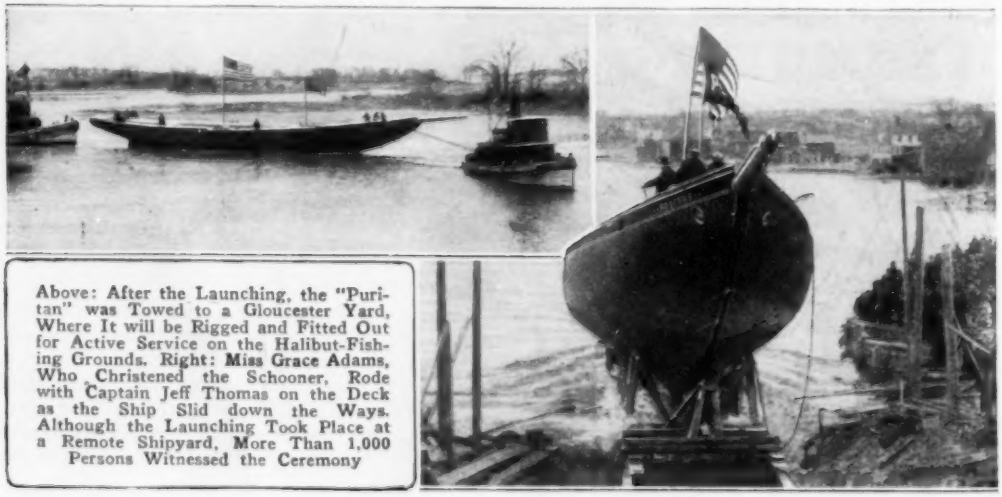
The "Puritan" was christened by Miss Grace Adams, of Malden, who, with Capt. Jeff Thomas, master of the craft, rode into the stream on the vessel. Although after sliding down the ways, the stern of the schooner fetched up against the opposite bank of the narrow Essex River, no damage was done. The craft is financed by the Manta Club, an organization of some 16 Gloucester men, formed to make efforts to put a schooner into the water capable of bringing back the international trophy to the United States.

Following the launching, the "Puritan" was towed to Gloucester, where it will be rigged and fitted out. Then it will leave, under Captain Thomas, for the halibut-fishing grounds for active service until the elimination races off Gloucester next October to pick the American challenger.

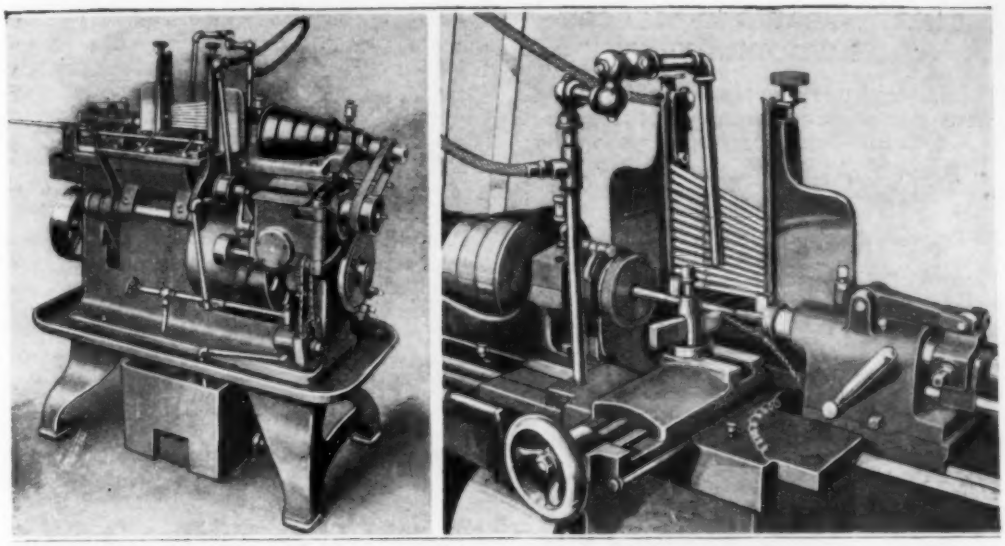
In the elimination races the "Puritan" may meet the Boston schooner "Mayflower," which was ruled out of the international contest last fall by the Canadian authorities on the ground that it was more of a yacht than a practical fishing schooner. The "Mayflower" has been actively engaged in the fishing industry for nearly a year, and quite probably will be allowed to enter the elimination contests.

Another schooner, of Boston build, is scheduled to enter the elimination tests. Plans call for its completion the latter part of April. It has been tentatively named "Uncle Sam." A group of Gloucester men arranged for its construction.

The "Puritan" is well within the regulations governing the international trophy competition. Its over-all length is 138 ft., water line 107 ft., beam 25.2 ft., depth of hold 11.91 ft., and draft 14.6 ft. It has a gross tonnage of 149. The construction throughout is that of the ordinary deep-water fishing craft. The bowsprit is 12 ft. outboard. It is approximately 20 tons lighter than the "Mayflower," and from deck to main topmast measures 10 ft. less in height.



Above: After the Launching, the "Puritan" was Towed to a Gloucester Yard, Where It will be Rigged and Fitted Out for Active Service on the Halibut-Fishing Grounds. Right: Miss Grace Adams, Who Christened the Schooner, Rode with Captain Jeff Thomas on the Deck as the Ship Slid down the Ways. Although the Launching Took Place at a Remote Shipyard, More Than 1,000 Persons Witnessed the Ceremony



Left: Rear View of Automatic Engine Lathe. Tank below Lathe Holds Supply of Cooling Compound, Which is Conveyed to the Work by Chain-Driven Gear Pump Seen at Right of It. Right: Close-Up, Showing Lathe at Work, with Magazine at Rear Half Filled with Cut Lengths of Bar Stock

NEW AUTOMATIC ENGINE LATHE FOR QUANTITY PRODUCTION

Engine lathes, entirely automatic in their action, taking the work from a magazine, gripping it and setting it up, and ejecting the finished piece, all without any attention from an operator, are now on the market. The machine is designed for quantity production, handling cut lengths of bar stock or forgings that must be turned on centers. All the operator has to do is to replenish the magazine, and keep the cutting tool in proper condition, and, therefore, he can attend to a number of machines simultaneously. In general, the machine resembles a common engine lathe, but in place of the lead screw is a drum cam for the carriage traverse. This cam has adjustable dogs which may be arranged to produce the required length of cut. In operation the carrier, connected with the magazine, moves forward, presenting the work in alinement with the centers. The tailstock center then moves up and pushes the work between the jaws of the driver, or chuck, and then the carriage moves the tool to the cutting position. At the end of the cut the tailstock spindle is withdrawn, the chuck is opened, and the work dropped out.

¶The Canadian Pacific Railroad is to resume work on its new ocean pier at Vancouver, B. C., which, together with the Ballantyne pier, will provide 10 additional steamship berths.

CAUSES OF FAILURE OF ROOF OF WASHINGTON THEATER

An investigation of the causes of the failure of the roof of the Knickerbocker theater, in Washington, D. C., when 97 people were killed and 135 injured, has been made by a committee of the Washington chapter of the American Association of Engineers. The committee consisted of N. D. Mitchell, chairman, and W. G. Noll, L. M. Neel, W. A. Slater, and J. A. Cliff. The features of the theater building that most deserve criticism, according to the report of the committee, were nine in number, as follows:

1. Support of main truss on a thin wall lacking solidity and mass.
2. Support of main truss on a skew bearing, combined with lack of stiffness in connection between the end post and lower chord of truss.
3. Failure to anchor trusses and heavy beams into walls.
4. Scant bearings at walls.
5. Insufficient section areas, and inadequate details of truss members.
6. Inadequate column bracing.
7. Absence of lateral support of intermediate panels of a main truss.
8. Absence of diagonal bracing between other trusses.
9. Inadequate strength of roof slab.

The committee expressed the opinion that every one of these nine items required correction to make the building safe, but that the correction of the first three alone would have postponed the failure of the roof. The conclusion drawn by the committee was that the construction of this building violated the building laws of the District of Columbia in many respects.

THIRTY-YEAR-OLD BICYCLE WITH WOODEN FRAME

At first glance a person would say that there was nothing strange about an old bicycle found in a Los Angeles shop, but

Nine Strips of Hickory Wood were Used in Making This Bicycle Frame, but They are So Skillfully Joined That It Has the Appearance of One Piece

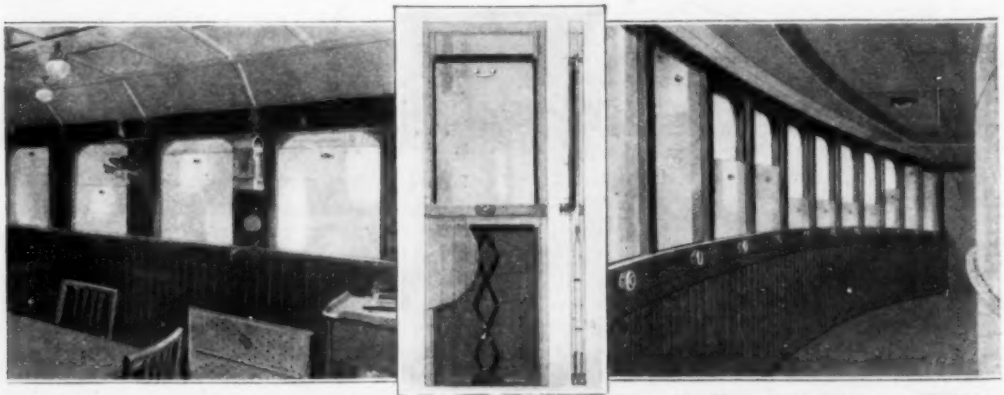
a closer inspection shows that the frame and forks are made entirely of hickory wood. Built 30 years ago when steel frames were very massive, this bicycle weighed 10 lb. less than the standard machine of those days.

PRACTICE CHART OF KEYBOARD ON TYPESETTING MACHINE

So that persons who are studying to become typesetting machine operators may practice at home, a copyrighted chart has been prepared which shows all the characters of the standard keyboard and the location in which they occur. In use, the chart can be fastened to a board or table top, which should be inclined to form about the same angle as the regular keyboard.

FRAMELESS WINDOW REPLACES SHIP'S CIRCULAR PORTHOLE

A notable feature of the modern passenger ship is the change from the old restricted circular porthole to a square type of window of generous proportions. The improvement is comparable to the change ashore from the old diamond pane to the balanced window sash. But, of course, at sea the ordinary framed window sash will not stand the exposure to spray and rain, where water-tightness is essential, without constant care and attention. For this reason a frameless window has been devised which consists entirely of thick plate glass with well-smoothed edges. The windows are now being installed quite extensively in ships built in England. They are used in all deckhouses, charthouses, and on the bridge. The window is a highly polished sheet of glass, its finished edges sliding in brass guides, thickly lined with felt. A handle is fixed at the top of the window, with which it is raised or lowered. It rests upon a double set of levers, hinged together so as to move in and out, on the well-known lazy-tong principle, the lower end terminating in a spring box in which the springs are so designed as to balance the window in any position. This is all housed in the wooden framing below the window, and at the top of the framing is a small brass handwheel which acts upon the guides so that they hold the window tight against vibration and leakage.



Balanced Frameless Ship Windows, Shown in Two Deckhouses, Illustrating Their Superiority over Old-Fashioned Round Portholes: In the Center Are Sectional Views, Showing Balancing Arrangement on a Double Set of Levers, like Lazy Tongs. The Small Handwheel above the Levers Tightens the Window to Prevent Vibration

Waterworks Project, Showing the Dam Which Controls the River: Beginning at the River Just above the Dam can be Seen the Canal That Leads to the Screen House. From the Screen House the Water is Carried through a Narrow Channel Leading to the Pipe Lines

ABSOLUTE CONTROL OF RIVER WITH WATERWORKS DAM

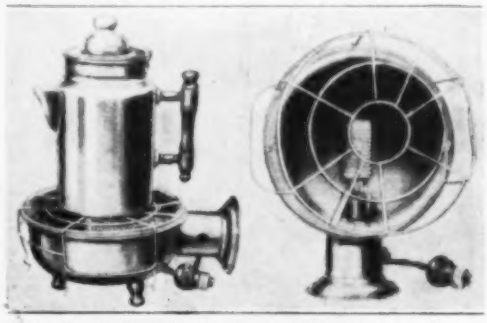
Controlling an entire river has been achieved by engineers of a waterworks project which supplies Portland, Ore., and which was lately completed about 20 miles east of that city. By means of a dam, 30 ft. high, the water is caused to pass through a canal, 30 ft. wide, 10 ft. deep, and 200 ft. in length. This canal has a screen house built upon it for removing gravel, or any other foreign matter, from the water, and leads to a pond from which are laid huge pipe lines to the reservoirs of the city. Besides giving absolute control of the water and eliminating the débris, the undertaking furnishes an additional 30-ft. head on the waterworks system.

ALIENS TO BE DEPORTED MAY BE HELD FOUR MONTHS

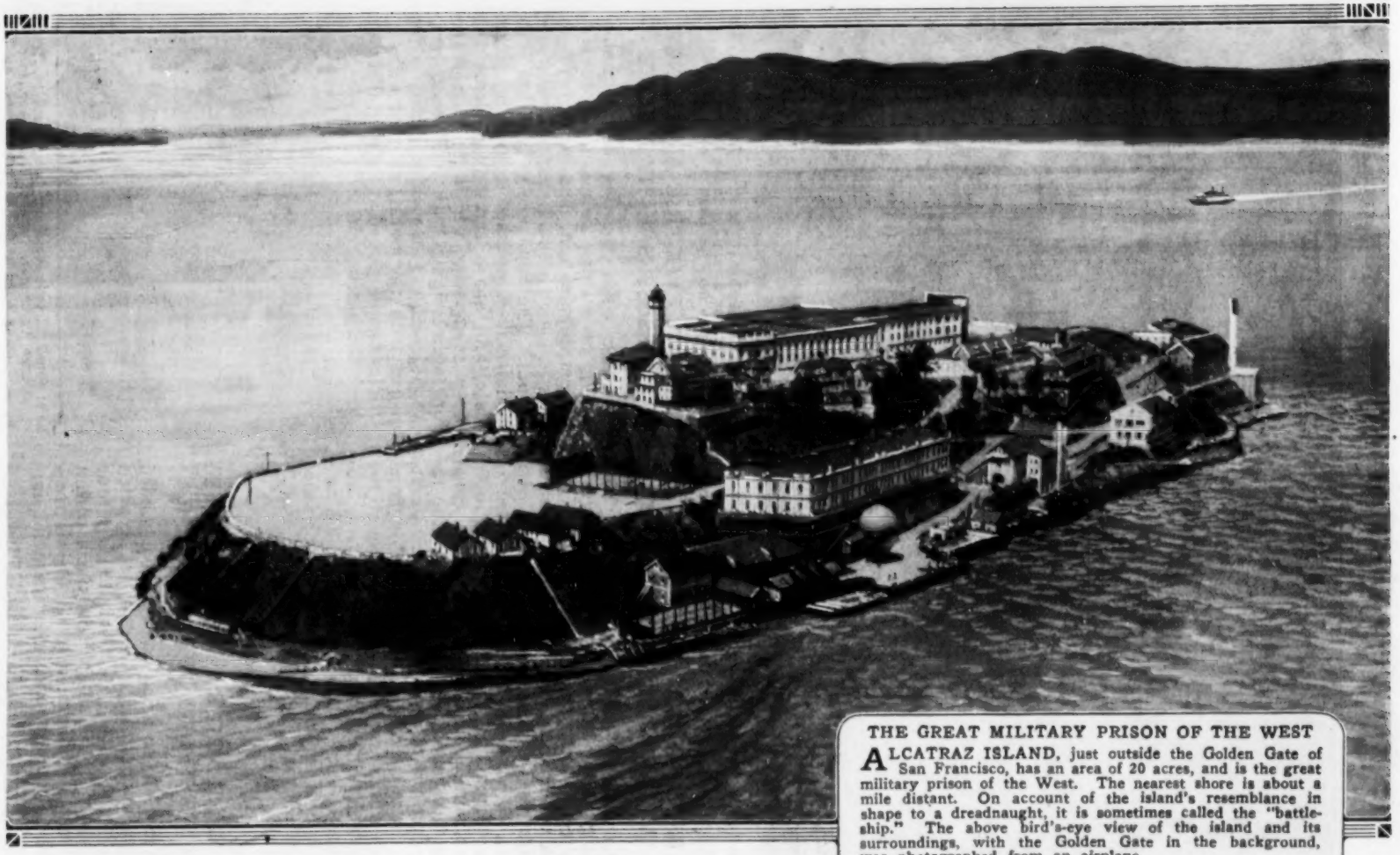
According to a decision recently handed down, undesirable aliens to be deported may be held by the authorities only four months. If action is not taken within that time, the alien may obtain his freedom on the grounds of "unlawful imprisonment."

SMALL ELECTRIC APPLIANCE POSSESSES MANY MERITS

Frying eggs, toasting bread, boiling water, or making coffee, and providing better illumination, are several of the uses to which a small electric heater may be put. The appliance weighs but 3 lb., is finished in polished copper or nickel-plate, and has a screw-type element of 615-watt capacity, which can be removed for interchanging with a 15-watt lamp. An adjustable spot-welded guard is furnished with the outfit, so that different articles can be placed at varying distances above the heating element.



Left: Small Electric Appliance being Used to Heat a Coffee Percolator. Right: Same Appliance being Used as an Ordinary Heater

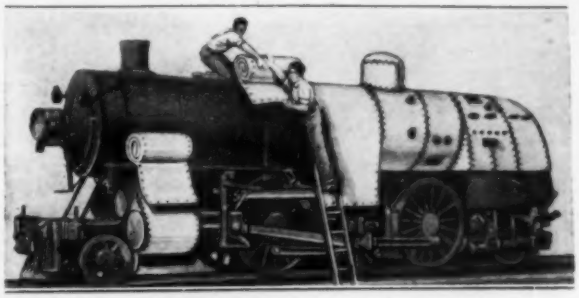


THE GREAT MILITARY PRISON OF THE WEST

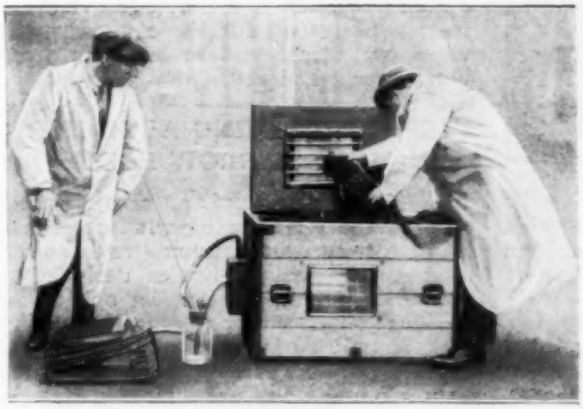
ALCATRAZ ISLAND, just outside the Golden Gate of San Francisco, has an area of 20 acres, and is the great military prison of the West. The nearest shore is about a mile distant. On account of the island's resemblance in shape to a dreadnaught, it is sometimes called the "battleship." The above bird's-eye view of the island and its surroundings, with the Golden Gate in the background, was photographed from an airplane.

ASBESTOS INSULATING MATS HAVE MANY ADVANTAGES

Asbestos mats as insulating coverings for boilers, steam cylinders, turbines, and similar machines, have been used for the last 20 years almost everywhere excepting in the United States, which is somewhat surprising considering their advantages. These mats, made preferably of South African blue asbestos, contain neither wire nor cotton carrier, and have great strength and durability. Their great advantage is the ease and rapidity with which they can be fitted as a cover for an object of very irregular shape, such as a locomotive, in which 10 or 15 strips of matting will do the work better, and in far less time, than with the ordinary block sections. These mats can be made in very large sizes, indeed in any size desired. The fiber filling possesses great strength and lightness.



Locomotive, with Its Irregular Surface, being Covered for Insulation with Extremely Flexible Asbestos Mats, Making the Work Easy and Rapid: The Work can be Completed in Much Less Time Than with the Usual Lagging



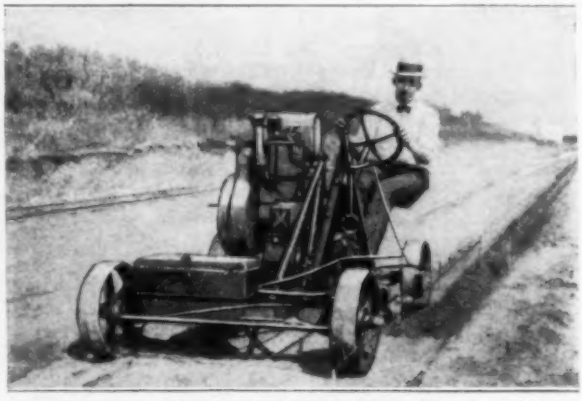
After the Sick Animal is Placed in the Box and the Air-Tight Cover Closed, the Anæsthetic is Forced In by Means of the Bellows

ANIMALS ANÆSTHETIZED IN SPECIAL CHAMBER

In a well-conducted zoo the animals receive the finest treatment, and, should one of them fall ill, it is examined by medical experts. In case an operation is deemed necessary an anæsthetic is administered in a special chamber designed for the purpose. This is a stout box fitted with an air-tight cover, and with windows at the sides and in the top, through which the condition of the patient may be noted as the anæsthetic is forced in by the bellows until the proper comatose condition is reached.

GASOLINE GRADER CUTS EIGHT-INCH TRENCH

For the use of contractors and highway engineers, a machine has been devised to take the place of some of the pick and shovel gang. It is a motor-driven trench cutter and can be steered to follow a chalk line. At the side of the machine, an eight-blade rotary spiral cutter makes a trench eight inches wide, true to grade, and leaves the bottom of the trench solid. The blades of the cutter are so arranged that only one blade cuts at a time to a depth of about one inch.



Steered along a Chalk Line, This Machine Cuts an Eight-Inch Trench True to Grade and Leaves the Bottom Solid

NEW VACUUM-TUBE AMPLIFIER AID TO PARTIALLY DEAF

Considerable progress has been made in the development of telephonic hearing aids for the partially deaf, but the limit

Telephonic Hearing Aid Which Employs a Vacuum-Tube Amplifier: Insert Shows the Instrument with the Case Open at the End

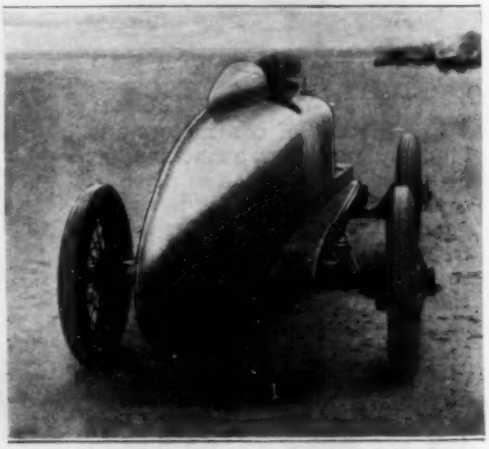
had apparently been reached along this line until the new vacuum-tube amplifier was produced. This tube, the result of the efforts of many inventors, consists primarily of a small electric bulb having within it a filament, a spiral wire called a grid, and a metallic plate, all in the order named. An electric current is caused to flow constantly between the filament and the plate in the tube employed in one of the latest hearing instruments. Sound waves striking upon the transmitter of the apparatus, are carried to the grid and greatly amplified by the effect of the current flowing between the filament and the plate, before ultimately reaching the receiver. A rheostat regulates this current in the tube, and correspondingly controls the volume of sound in the receiver, so that the user of this particular instrument is enabled to adjust it so as to conform to his peculiar degree of deafness. The outfit is compactly mounted in a small leather-covered case not unlike the ordinary camera for size, and weighs but 6½ lb., so that it can be carried conveniently on the street, to the church, or theater, as well as proving invaluable in the home. This latest hearing aid is simple of operation and will yield a natural reproduction of voices to persons thus afflicted.

TREATMENT FOR CITRUS FRUIT MAKES ICING UNNECESSARY

After the grower of citrus fruits has successfully combated adverse weather conditions, blights, and pests, and finally has the ripened fruit ready for market, he still has to face the problem of delivering that fruit to market before it spoils. Under average conditions, this means that the time elapsed from the tree to the consumer should be about 15 days, even when the fruit is precooled and shipped in refrigerator cars. Now, however, this condition may be changed if a new chemical treatment fulfills the claims that are made for it. By this method a chemical emulsion in paraffin is brushed over the fruit as it passes to the packing bins. The chemicals kill all germs and agencies of decay, and then evaporate without leaving taste or odor, while the paraffin seals the fruit air-tight and prevents withering and evaporation. It is claimed that fruit so treated has stood for three months, and when cut, was found to be as firm and juicy as when picked.

SPECIAL RACING AUTO HAS VERY NARROW BODY

In the making of automobile-speed records the question of wind resistance is of utmost importance, and special attention is paid to bodies designed to reduce it to a minimum. In one of the modern speed wagons the streamline body is only 20 in. wide and barely provides room for the driver, whose head only is exposed when seated. This car has covered a mile in the remarkable time of 22⅝ seconds.



This Modern Speed Buggy Has a Streamline Body Only 20 Inches Wide

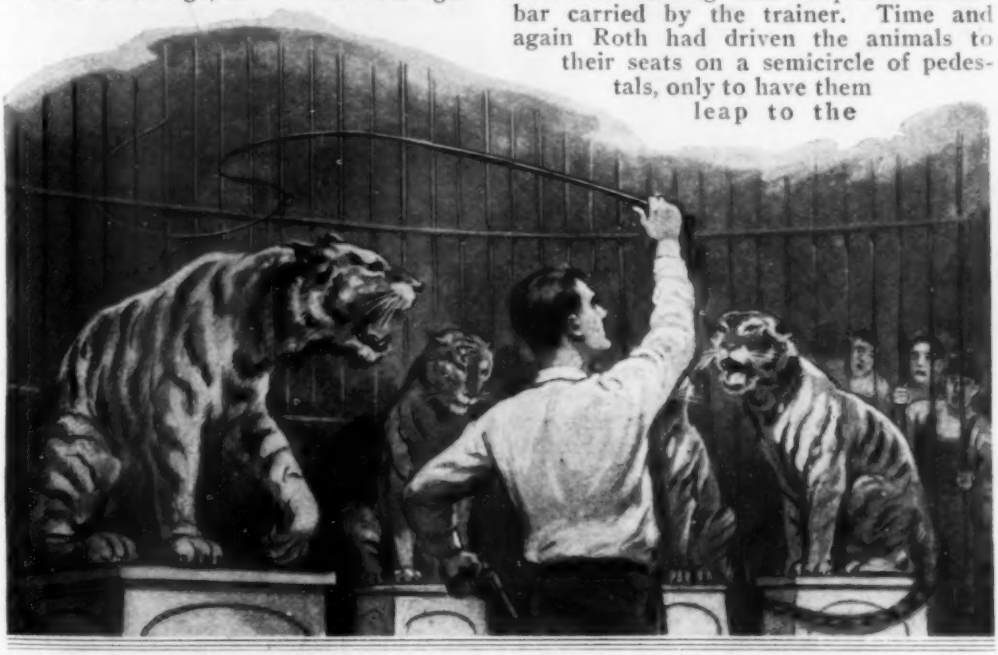
BEHIND THE MENAGERIE GUARD ROPES

By Frank Braden

THERE'S a saying in the circus zoo when a new attendant, disregarding the warnings of old-timers, becomes careless while working about the cages. "Here's a new animal trainer," the veterans will remark, as they watch the fresh helper petting a tiger or a leopard. They know that it is only a matter of a few days until the "cat" will lash out with its claws unsheathed and rip the arm of the newcomer. They also know that nothing will teach this type of attendant the alert carefulness necessary in handling wild beasts but an ugly scratching. They can only hope that the man's hurts will be slight. He must have a lesson. He must realize that all animals are dangerous at all times, even if some are more so than others.

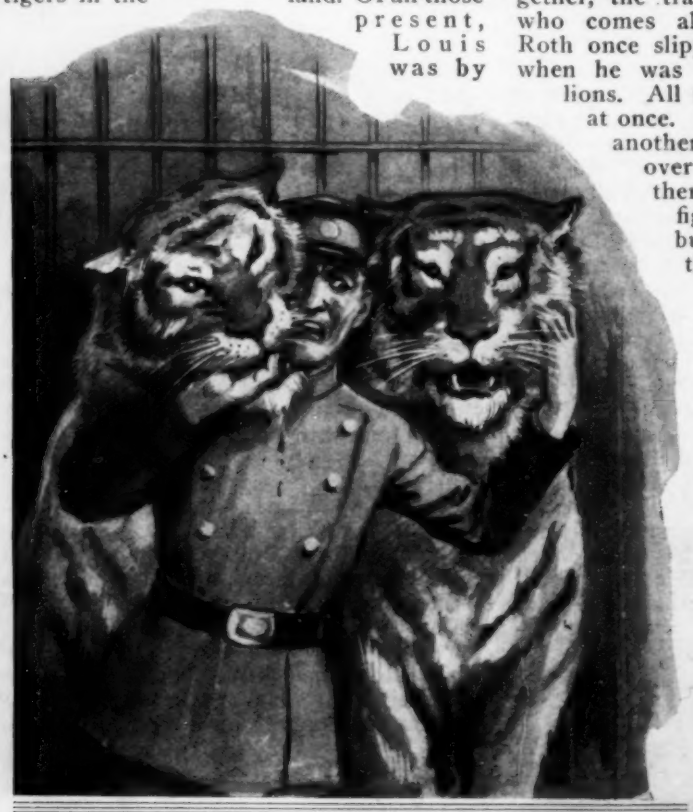
One often hears it contemptuously remarked that such and such a beast in an act is "just a mangy, toothless old lion," but often that mangy, toothless old lion, because of its age, is more dangerous than its mates in their prime. The old lion is testy, and no matter what its years, it carries a wallop that will break the back of a horse—a wallop backed by ripping claws. Some of the world's foremost trainers, working with the same beasts in acts year after year, have paid for the slight carelessness that familiarity with and affection for their jungle pets have insidiously brought about. At an unexpected diversion—the overturning of a pedestal, for instance—the animals have leaped upon their mentor, but with the element of complete surprise absent, for no real wild-animal expert is caught completely unaware by a beast's leap. The trainer knows one saving fact—the animal must set itself to spring.

Not long ago Louis Roth, one of America's front-rank trainers, was rehearsing a troupe of eight Royal Bengal tigers in the steel-bound circus arena. The beasts were sulky, snarling, spitting as they resisted the forcing with whip and slender bar carried by the trainer. Time and again Roth had driven the animals to their seats on a semicircle of pedestals, only to have them leap to the



"When, to the circus people gazing breathlessly on, it seemed that 'Prince' was in the very act of springing on his trainer, Roth calmly turned his back and swung his snapping whiplash at the other cats."

ground as he turned away. The real battle of wills had attracted a large number of the circus folk to the vicinity of the arena. They stood watching anxiously, for they realized that Roth was in trouble, and that he must conquer or lose control of the finest group of Bengal tigers in the land. Of all those present, Louis was by far the least perturbed. He had to win. He knew it, and he forced the issue with the tigers with relentless purpose. Again he drove them to their seats, firing blanks in his revolver, as "Prince," the largest of the group, struck at him blindly, viciously. When, to the circus people gazing breathlessly on, it seemed that "Prince" was in the very act of springing on his trainer, Roth calmly turned his back and swung his snapping whiplash at the other cats. When he finished his work with the animals, Roth was asked how he dared turn his back on "Prince." "He was bluffing!" exclaimed the trainer. "I could tell by his eyes and his muscles that he wasn't set to spring. When a tiger springs he must get set; he must contract his muscles, measure his distance, switch his tail, as though it were a rudder. The cat does all this in a second, but a good trainer knows, and has time to disconcert the beast with rod, whip, or gun fire."



"He stood between the two largest of the group, with his arms around their necks, their faces pressed against his own. Slowly, irresistibly, the tiger on his right straightened, suddenly to turn and sink his fangs into Roth's right cheek, the long teeth meeting over the trainer's jawbone."

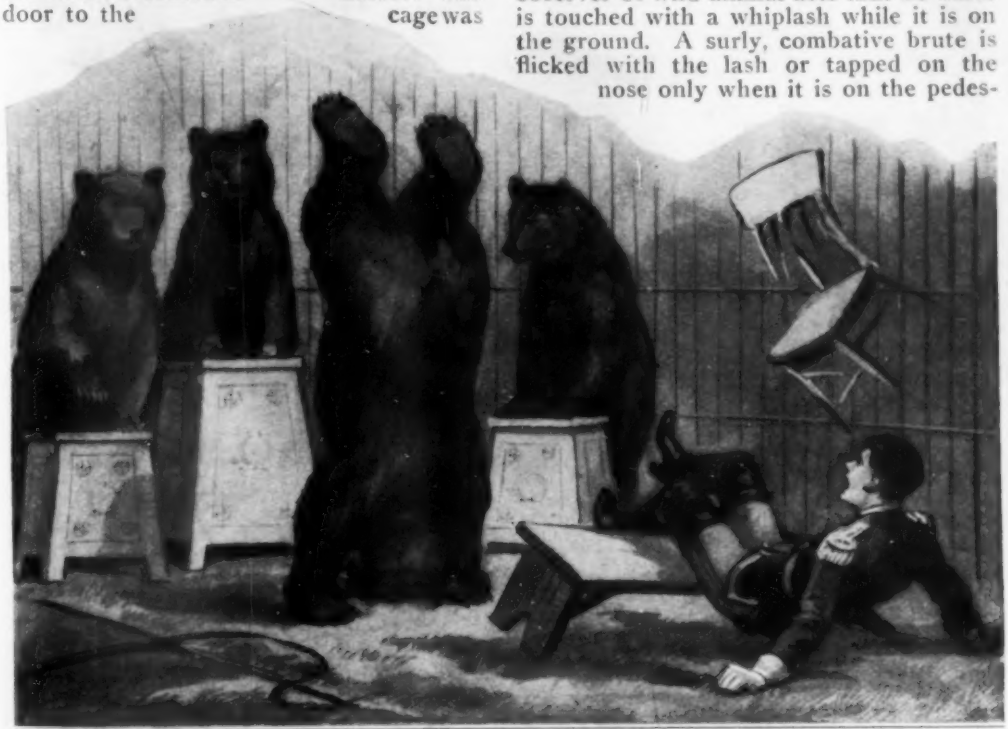
However, if a number of cats spring together, the trainer is fortunate, indeed, who comes alive through the ordeal. Roth once slipped and fell in the arena when he was "performing" 18 African lions. All the beasts leaped for him at once. Naturally, they struck one another as they met in full flight over his body. Immediately there started the fiercest lion fight in the history of show business—a tremendous battle, with Roth underneath the roaring, ripping, slashing mass of maddened beasts. Attendants, with steel rods, revolvers, and flares, worked like mad, as the trainer, cool even beneath this jungle bedlam, lay perfectly still, waiting a chance to work his way from under the mass of writhing, fighting lions to the door of the great steel cage. Finally, attendants forced the fighting away from Roth, who battled his way out, his clothing ripped into shreds, his body bleeding from 42 cuts.

Another time, Roth was winding up a tiger act with an exhibition of superb confidence in his control. He stood between the two largest of the group, with his arms around their necks, their faces pressed against his own. Slowly, irresistibly, the tiger on his right straightened, suddenly to turn and sink his fangs into Roth's right cheek, the long teeth meeting over the trainer's jawbone. One can imagine the agony of it, but Louis Roth held himself absolutely still. With the smell of the blood reaching the tiger on the left, the slightest movement, reasoned the trainer, meant that beast's turning to crush his shoulder or jaw on that side. With infinite care, with almost imperceptible effort, Roth ever so slowly disengaged the fangs of the first tiger from his face. Then he slowly stepped back—and fainted. Alert, loyal helpers, who had

watched their chance from the door of the arena, rushed in firing blanks, and dragged him to safety. When Roth was able to stand, with his wounds roughly bandaged, he stepped into the arena again and raced the two tigers through a routine of tricks. He did this to maintain his control over them, and it was less than a week before he was again doing his cuddling pose with them, his arms affectionately about their necks.

Naturally, trainers that have worked the same group of wild animals year in and year out, grow more or less fond of their charges, and in spite of their knowledge of the beasts' inherent treachery, become too confident of their ready obedience. There is a celebrated woman trainer—Martha Florine—who worked the same group of tigers for 10 years. Each day she rode in parade in the cage with her animals, sitting in a chair with her feet resting on the neck of the largest of them. While the cage was rolling along in the main street of a western city two years ago, the tigers leaped upon her without warning. They knocked her to the floor of the cage, as the crowds along the curbs screamed in horror. The door to the cage was locked, and the drivers and parade marshals, who ran to the rescue, could not get in. A man with an elephant hook beat several of the tigers off the unconscious girl, saving her life although she was terribly lacerated, before an ax could be secured in a store and an entrance to the cage effected. She was six months recovering from her wounds, but she is working the same tigers now.

The layman often wonders how the first step in obtaining control of and training wild animals is gone about. Usually the cat animal—lion, tiger, leopard, puma, or jaguar—is "collared," that is, a collar is snapped on its neck, and the beast is held in check by a chain, the end of which is in the hands of attendants outside the steel training arena. The trainer enters the cage in safety and guides the animal to a stool or pedestal, on which he urges it to take position. No animal is beaten into doing the trainer's will, as some suppose. To punish an animal in early teaching is ruinous, and only when it knows what is wanted and refuses, is it touched with a whip. It will be noticed by the close observer of wild-animal acts that no beast is touched with a whiplash while it is on the ground. A surly, combative brute is flicked with the lash or tapped on the nose only when it is on the pedes-



"As the trainer grabbed a rod, the bear sent it spinning and knocked Barry over a bench. . . . The manager, apparently unmoved by Barry's mishap, stood outside yelling: 'Great! Good stuff! Keep it up!' Barry, alternating between justifiable anger at the manager and fright, was astounded to see the bear calmly take position and stand on his head!"

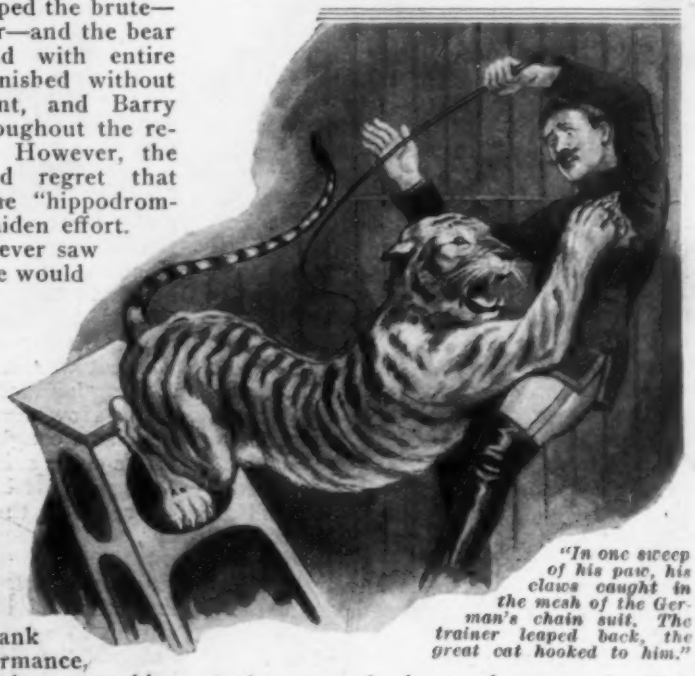
tal. There is a good reason for this. The animal first feels the lash when it is learning to jump on and off the pedestal at the trainer's command. It is then on the chain leash, and if it attempts to spring at its taskmaster, the chain checks it abruptly. Later, when it is unleashed, the habit prevails. The animal seems to feel that it is still chained when on the pedestal. Thus, trainers invariably punish refusals while the beast is so placed. The danger of a spring is thus minimized. Of course, too much trust cannot be put in this mental trait of the performing cat, as has been shown above in Louis Roth's experiences.

"The first performing hippopotamus became a performer through his first and only escape . . . the great behemoth broke into a run, turning into the hippodrome track of the main tent, around which 9,000 spectators sat in the stands."

Charles Barry, a leading American trainer, made his début in a wild animal arena with a troupe of performing bears. Because of the fierceness of one of them —a huge cinnamon—several trainers had failed in presenting the act. Barry, who had shown especial aptitude as an aid and who had had marked success with domestic animals, was prevailed upon by the manager to put the bears through their paces in the center arena. It was in Roseburg, Ore., that Barry, clad in a blue-and-gold suit and patent-leather boots, made his bow from the circle of bears. Everything went splendidly until Barry attempted to make the big bruin stand on his head. He gave the animal the cue for the trick, but the brute had become interested in some green grass that had not been trampled down in the arena. He ignored Barry's cue and nibbled unconcernedly at his find. The young trainer smacked him with his whip. Before Barry could move, the bear had knocked his whip from his hand. As the trainer grabbed a rod, the bear sent it spinning and knocked Barry over a bench. As he fell, Barry grabbed a chair, but before he could raise it, the bear seized it and threw it against the arena bars. Attendants then pushed the bear back with rods and gun fire, while Barry leaped for his whip and the door. The manager, apparently unmoved by Barry's mishap, stood outside yelling: "Great! Good stuff! Keep it up!" Barry, alternating between jus-

tifiable anger at the manager and fright, was astounded to see the bear calmly take position and stand on his head! The young trainer then showed his mettle. He doffed his cap and made his long-delayed bow. As he did so, the bear righted himself and nipped him on the boot. Barry again tapped the brute—viciously and in wild anger—and the bear took another head stand with entire docility. The act was finished without further untoward incident, and Barry worked it with credit throughout the remainder of the season. However, the manager often expressed regret that Barry did not put in the "hippodroming" that featured his maiden effort. "It was the biggest hit I ever saw in a wild-animal arena," he would remark.

Many accidents and escapes of wild animals occur in a circus menagerie, of which audiences in the big top adjoining fortunately know nothing. There is the celebrated case of the first performing hippopotamus, which became a performer through his first and only escape. This animal, which is not vicious, crawled from his tank during an afternoon performance, and was first discovered as he was making his way into the big top. A menagerie man attempted to head him off, but the great behemoth broke into a run, turning into the hippodrome track of the main tent, around which 9,000 spectators sat in the stands enjoying the show. True to circus tradition, there was no confusion among the performers or other employes of the circus, but ringmasters and property men raced to head the hippo and turn him back. Now, be it known, a full-grown hippopotamus, huge and awkward as he is, can outrun a fleet-footed man. This hippo astounded the circus employes by breaking into a sprint and circling the track before the audience had the least idea that anything was wrong. Hardly had the announcer bawled his "Keep your seats, good people!" before the hippopotamus completed the circle, turned again into the menagerie, and crashed headlong into the aviary wagon, with the result that tropical birds were flying all over the place in no time. The hippo stopped short and moved over to the elephant lines, where he placidly helped himself to the pachyderms' hay, without alarming those huge beasts in the least. He was returned to his cage, the birds, with few losses, housed in makeshift cages, and the big show went on without a "bobble." However, the trainers had been shocked into a big idea. They would train the hippopotamus to circle the hippodrome track—but under control. This they did the following winter, and only a small whip is now needed to guide the lumbering creature, which, however, is never urged out of a walk. It is a big feature of the show today, but the audience that saw the incident which inspired it, will never forget the speed made by the ponderous, short-legged "blood-sweating behemoth of Holy Writ"—nor will the circus people, for that matter.



"In one sweep of his paw, his claws caught in the mesh of the German's chain suit. The trainer leaped back, the great cat hooked to him."

The hippopotamus is only dangerous when he charges, and then by reason of his great bulk and through his habit of ramming with his heavy snout. However, his charge is diverted and halted by animal men with whips, who have but to strike him on the head, even tap him, to change his course and slow him up. When the hippo mentioned above circles the track, the attendants keep flicking him with whips on the side of his face toward the audience. This keeps his gaze toward the rings, and should he start to charge, he could easily be halted before any damage, except to circus paraphernalia, perhaps, could result.

There is in the Salt Lake zoo now a

lion by the name of "Brutus," a great, splendid specimen of the black-maned African king of beasts. "Brutus" has a record as a "bad" lion. He has slashed and torn many trainers. Because of his magnificent appearance, every effort was made to subdue him. The best trainers in America "worked" him; and they all bear the scars of "The Order of Brutus," as the zoo men termed the group of wild-animal men who were roughed by the mighty cat. Once a great German trainer announced that he had succeeded in working "Brutus" in winter quarters with a polar bear. He took the manager of the circus and a party of friends to the animal barn to view the act. The lion and the polar bear were turned into the arena together. "Brutus" instantly leaped on the bear, killing it. He then literally ate it up, and the combined efforts of the German trainer and his helpers could not separate him from his kill. Some time later Charles Barry entered the steel training cage with "Brutus." The lion wasted no time; leaping 15 feet at the trainer, who managed to dodge. "Brutus'" head struck the steel bars, and he was dazed. Before he could spring again, Barry knocked him out with a bar. The circus manager then gave orders that "Brutus" was through as a performer, and forbade any trainer entering his cage. The animal was shortly afterward sold to the Salt Lake zoo, where he is securely housed—the finest lion on exhibition anywhere in America.

There is the story of one of Bostock's trainers, who volunteered to subdue a "bad" tiger—a Royal Bengal outlaw. The tiger was a great performer, but he had suddenly turned renegade, killing one trainer and injuring several. The Bostock man, a German of large physique, not only offered to subdue the animal but promised to present him in the first public performance in Leeds, Eng. Now, the trainer had a plan. He purchased for use in the arena a suit of steel mail, woven to fit him under his uniform. However, his pride prevented his telling anyone with the show about the suit, and as he had encountered little trouble in the training cage with the beast, he saw no reason for any confidences afterward in the matter of his armor. The night of the opening in Leeds, he entered the arena and signaled for the attendants to open the runway gate and let in the tiger. Announcements had been made of the brute's ferocity and almost supernatural strength, and a large audience was present to view the thriller. All went well for a while. Encouraged by his success, the German began to "hippodrome" with his charge: that is, he teased the beast into striking at him as the animal sat on the pedestal. The cat was in a fine performing humor, striking and snarling in a semblance of fury. However, in one sweep of his paw, his claws caught in the mesh of the German's chain suit. The trainer leaped back, the great cat hooked to him. Both lost their heads, the tiger bounding, screaming, spitting as it leaped, rolled, and threshed about, apparently tearing the man into ribbons. Women fainted and men shouted their terror. The cat was unable to extricate his claws, and in the hubbub, the German could not make the helpers understand why they could not drive the tiger from him. At last, a terrific blow on the head stilled the beast, and the claws were extricated from the mesh. The trainer suffered only a few minute scratches, but the audience, which had almost stampeded from the circus building, was convinced it had seen a man eaten alive by a jungle demon.

Above: Radio Garter, Showing the Receiver, Crystal, and Snap Chains. Left: Illustrating How the Radio Garter is Worn and the Manner of Using It

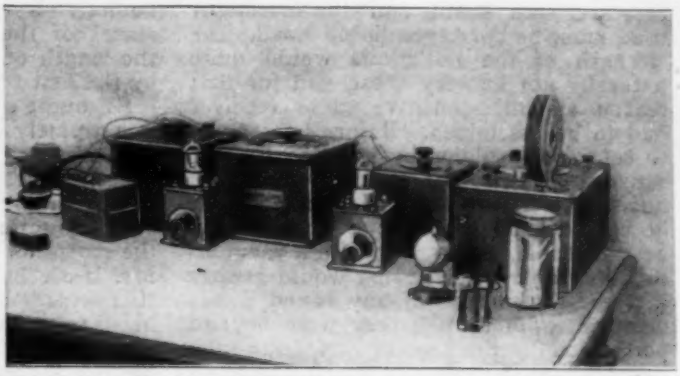
RADIO GARTER LATEST FAD FOR WIRELESS FANS

Feminine wireless fans will be interested in the introduction of a tiny radio set which is made in the shape of, and is worn as, a garter. Wire is coiled around a piece of cardboard, which is covered with silk, and attached to this are two ordinary eyeglass snap chains, one fastened to the foot and furnishing the ground, while the other is affixed to a coil of wire in the hat and forms the aerial. A small bottle containing the necessary crystal, or rectifier, and a receiver complete the apparatus, which has undergone tests and proved practical.

SCIENTIST INVESTIGATING "MOTH RADIOGRAMS"

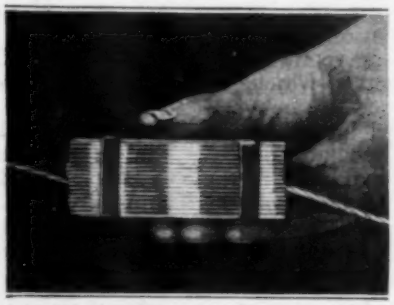
By L. D. LOTTON

MOTHS and some other insects have a very mysterious way of communicating with each other. The female moth may be caged in a scent and soundproof box, and yet she is able to summon the male moth without apparent trouble. Entomologists have been puzzled by this phenomenon for a long time, and it was recently suggested that a system of radio might be used by the insects. Following this suggestion, a New York scientist, L. C. F. Horle, started to investigate the subject. The ingenious apparatus he employed and the results he has achieved, although not conclusive, are highly interesting.



Apparatus Used by Mr. Horle, the New York Scientist, in Investigating the Methods of Communication between Moths, Presumably by Some System Resembling the Propagation of Wireless Waves

To the layman, the subject may be more or less confusing, since he cannot possibly understand how a living creature could propagate wireless waves. In the firefly we see a creature that is able to send forth visible rays. Scientists now know that the only difference between visible and invisible waves is a matter of wave length. Wireless waves are long, and light waves are short, but they are both of the same nature. If one insect is able to send forth visible waves, why should not another be able to send forth invisible waves? In order to send wireless waves from one point to another, we all know that electric power is necessary. We also know that there are certain creatures, like the electric eel, that are able to produce within their own bodies electric currents of very high potential. This proves that a living creature can generate an electric current. In fact, the human heart produces a weak galvanic current at every beat, and this current has been measured.



The Sensitive Condenser Microphone Used, Which Is Much More Sensitive Than a Telephone Transmitter

In watching moths and studying their action, scientists have noticed the peculiar way in which they use their antennæ. When the male is some distance from the female, it will wave its antennæ about first in this direction and then in that, as though it were trying to locate the direction in which a message was coming. After some experimentation in this way, the male will take to its wings and fly off to the female.

The apparatus used by Mr. Horle has been especially developed to respond to very short wave lengths. If the creatures do send wireless waves, they must be

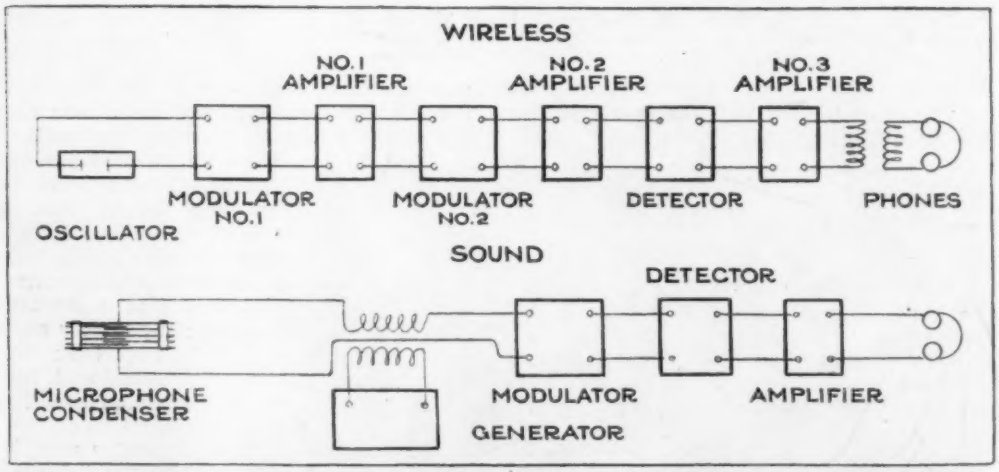
"Listening In" for the Moth Messages: The Female Moth is Imprisoned in the Glass Bottle Seen on the Table. So Far No Conclusive Evidence of the Wireless Nature of These Messages has been Found

of a length that will put them somewhere between those we call heat and the shortest of those that can be called radio. The wave lengths must be short, since the creatures are small and the oscillator used must be correspondingly small. The strength of the radiations would quite naturally not be very great, and for that reason an ultra-sensitive radio receiver had to be assembled. Before he set out to solve the problem by wireless, he first satisfied himself that sound waves were not used. To do this he invented what he calls a "cell microphone," based on a new principle, and used it with a vacuum-tube amplifying device that would greatly increase the volume of any sound waves detected, even though they were beyond perception by the human ear. Although this apparatus was used under the most favorable conditions, no sound was heard that could be identified as insect communication. His radio device, although of great interest to radio technicians, is too involved to be understood in detail by laymen. Since there is no wave meter that will measure the radiation that could be set up by a moth, owing to its smallness, he assembled a receiver which, by successive modulation processes, converted the small wave lengths into those of the usual magnitude. An oscillator of special design was placed in proximity to the insects. The natural frequency of the oscillator was varied to cover a wide range in wave lengths. The small powers produced from the oscillator were allowed to react upon a radio generator of more nearly usual frequencies. This process was duplicated several times until the original wave lengths detected were greatly lengthened and the strength of the radio-frequency current produced by them increased to a point where they would be audible. By knowing the electrical constants of the various circuits employed, the length of the original waves detected by the first receiver could be calculated.

An outfit of the nature described above is extremely difficult to handle, owing to the presence of the numerous vacuum tubes. Unless they are carefully watched and regulated, the tubes will set up various noises which would interfere with the reception of moth messages. Although Mr. Horle has not as yet heard anything that could be identified as a message between insects, he believes this means, not absolute failure, but rather that he has not succeeded in getting his apparatus adjusted to a point where it would be sensitive to small radiations of low intensity. Never before has such an outfit been assembled, and it is but natural that considerable experience will be required before results can be expected.

ITALIAN POWER PROJECT USES OLD LAKE BEDS FOR STORAGE

Many interesting conditions are met in the development of hydroelectric power in southern Italy, but one of the most unusual is in the project on the Sila River in Catanzaro. In this mountainous region there were several basins, believed to have been the beds of ancient lakes which are now dried up, and these are to be used as storage reservoirs for impounding the water.



Fully Notated Diagrams of the Apparatus and the Wiring, as Used in Experiments on Sound and Wireless Waves: Lower Diagram Shows the Apparatus Used for Sound Waves, and the Upper One That Used for Wireless Waves

CONQUERING MOUNT RAINIER IN MIDWINTER

By LAWRENCE WILLIAM PEDROSE

The Summit of Mount Rainier, Conquered for the First Time in Midwinter by a Party of Four Adventurers: The Men are Here Seen Hoisting the American Flag on the Summit, the Climax of a Two Weeks' Struggle with Natural Elements

AFTER a two weeks' contest with storms, four men late in February succeeded in scaling the summit of Mount Rainier, the second highest mountain in the United States. Although in former years many attempts had been made to climb the 14,500-ft. peak in winter, none had been successful.

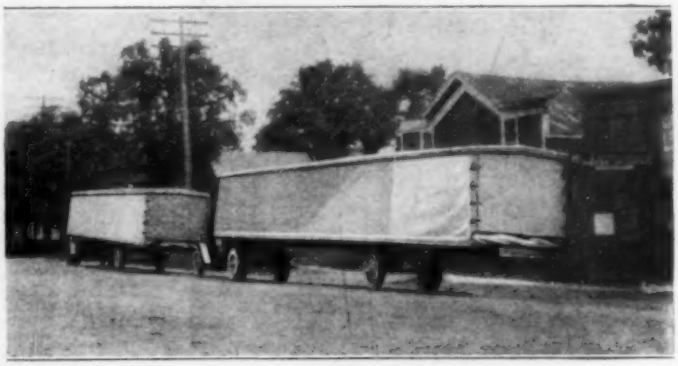
The climbing party consisted of an American, a Frenchman, and two Swiss. All except the American were experienced alpinists. There was no monetary reward for the climb, and the adventure was undertaken for the sheer love of the thing.

The preliminary work of scaling the mountain was carried out carefully. Various approaches were reconnoitered, and this precaution took up most of the men's time. The actual scaling of the peak required only five hours, and the return four and one-half hours.

Roped together, 24 ft. apart, with the alpinists in the lead, the men made the dangerous climb, each carrying a pack weighing about 40 lb. At the "Shutes," one of the most hazardous points of the climb, progress was won only by chopping footholds in the ice. At the summit the storm cleared sufficiently for the men to make several remarkable pictures.

COVERED TRUCKS HAUL FIVE AUTO BODIES

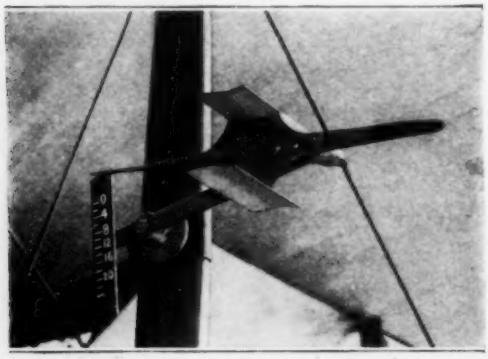
Long trucks having canvas covers are used to carry all the closed-car bodies from a Detroit factory to an automobile company in Flint, Mich. Each truck, of which there are 10 now in use, is 55 ft. in length, and has a capacity of five bodies. Motorists on the narrow highway find difficulty in passing the long trucks.



Specially Made Motor Trucks Having Long Canvas Covers, Shown en Route on One of Their Daily Trips from the Factory: Each Truck Contains Five Closed-Car Bodies

ANGLE OF AIRPLANE'S FLIGHT AUTOMATICALLY INDICATED

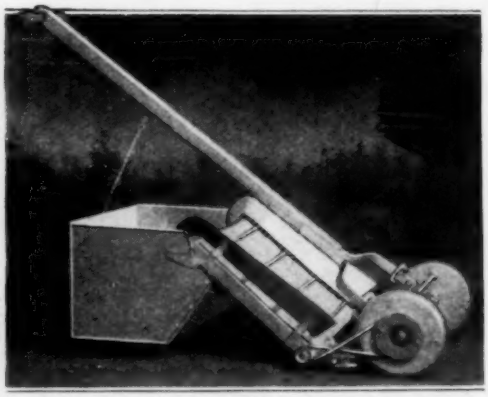
Difficulty is experienced by the pilot of an airplane in accurately determining whether he is traveling up, down, or parallel with the earth. The position taken by the plane is termed the angle of attack, meaning the angle at which it is attacking the air, and to determine this an arrangement has been brought out, having a scale which moves with the strut, and a balanced indicator that always maintains a position parallel with the earth. This apparatus is located near the airman, who can easily tell at a glance whether the craft is traveling on an inclined or level course.



Indicator Fastened to Airplane Strut So the Pilot can Tell at a Glance His Angle of Flight

LAWN-MOWER GRASS CARRIER WORKS ON NEW PRINCIPLE

An attachment for carrying the grass cut by a lawn mower, which extends no farther back than the old-fashioned canvas basket, has lately been put on the market. The outfit consists of a grass container made of galvanized iron, to which are fastened two wooden rollers and an endless canvas belt. The rollers are driven by a cross belt from the wheel of the mower, and these operate the canvas conveyor, so that the cut grass is constantly carried away from the mower blades and deposited in the large pan.



Grass Carrier, Attached to Lawn Mower, Showing the Endless Canvas Belt and the Galvanized-Iron Container

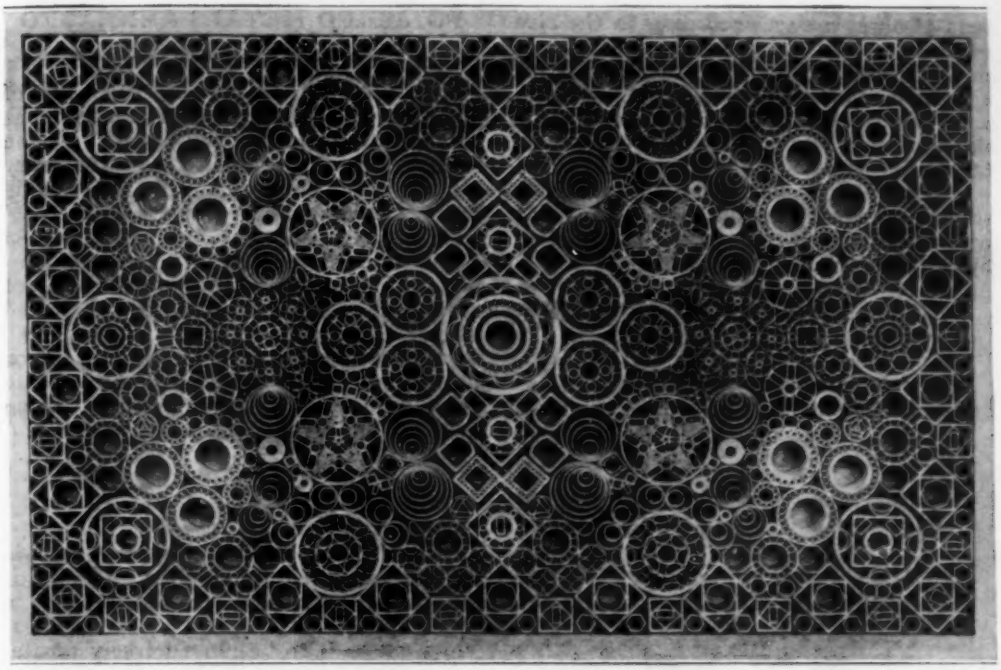
A NEW INCUBATOR EGG TRAY TURNS ALL EGGS AT ONCE

The present hatching season has marked the introduction of a new type of incubator egg tray which not only adds 25 per cent to the egg-holding capacity of the machine, but also provides a mechanical turning device which turns all the eggs in a few minutes, without removing them from the machine. The eggs are held, pointed end down, in a series of metal cradles which are supported on pivots at both ends. These pivoted ends are carried on a shifting lever which can slide along the side of the tray. By moving the lever, all the eggs are turned in a fraction of the time required by the older method of turning by hand.

In This Incubator Tray the Eggs are Supported in Metal Cradles Which are Pivoted in the Sliding Bars at Their Ends

ATMOSPHERE OF PLANET VENUS CONTAINS NO OXYGEN

According to spectroscopic studies made at the Mount Wilson Observatory of the light received from Venus, no oxygen-absorption lines are found. This indicates that there is no oxygen or water vapor in the outer atmosphere of Venus, and furthermore that the reflected light of the sun must have penetrated to a considerable depth. It therefore appears necessary to attribute the great brightness of Venus to some other cause than that of high reflective power of water-vapor clouds, and this apparent absence of oxygen must be considered in connection with speculations as to the conditions of the planet.



Ornamental Table Top, Showing the Various and Intricate Designs Wrought by the Maker of This Most Unusual Piece of Furniture: The Multitude of Varied Shapes and Sizes Are But the Ends of Seamless-Steel Tubing

ORNAMENTAL TABLE TOP MADE FROM STEEL TUBING

Hundreds of pieces of seamless-steel tubing were used recently in the construction of an ornamental table top, producing a neat and original pattern. As this tubing is made in nearly every conceivable shape and size, the number of designs wrought in the top were limited only by the ingenuity of the maker. Ends of tubes were cut off and these, circles, squares, oblongs, rectangles, ovals, hexagons, crescents, etc., were then imbedded in a soft substance and allowed to "set." After being highly polished and given a coating of lacquer, this table top is said to be one of the most unusual pieces of furniture ever manufactured.

TRACTOR AND AUTOMOBILE MAKE PIONEERING EASY

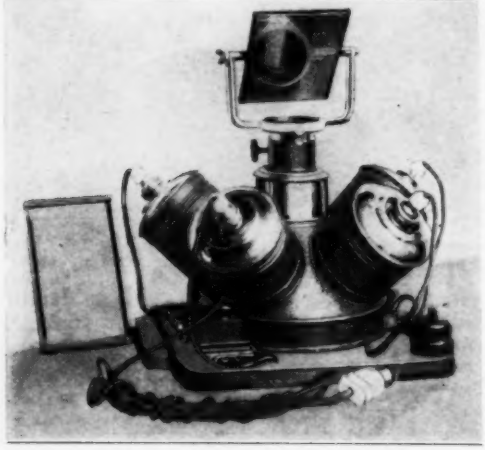
Automobiles in place of prairie schooners, and gasoline tractors in place of ox teams, mark the difference between modern and ancient pioneering. After settlement upon the land, the difference is between plowing with a yoke of oxen and a single-share plow at the rate of about an acre a day, and plowing with tractor-hauled gangplows at the rate of

Modern Pioneer Taking a 140-Mile Jaunt on a Tractor Which is Hauling a Load of Four Tons, Including the Indispensable Automobile: Note the Headlight on the Tractor for Night Traveling

tens of acres a day, according to the size of the tractor. In a recent instance of modern pioneering, the traveling outfit consisted of a tractor that hauled an ordinary lumber wagon in which were loaded the pioneer's farming and camping outfits, and a gasoline tank. Hitched to this was the inevitable automobile with a truck attachment in the rear, handy for personal baggage. The whole load pulled by the tractor was four tons.

PROJECT VIEWS OF OBJECTS WITH REFLECTING DEVICE

A new form of projection apparatus has been developed abroad which can be



When Placed over Objects, Printed Pages, or Photographs, This Apparatus will Project Views of Them Which can be Thrown onto a Screen

placed directly over the objects, printed pages, or photographs to be shown. Four high-power lights illuminate the object and the view is projected by the lens into the mirror above, which reflects it on the screen.

CHURCH BELLS DEMONSTRATED OVER THE TELEPHONE

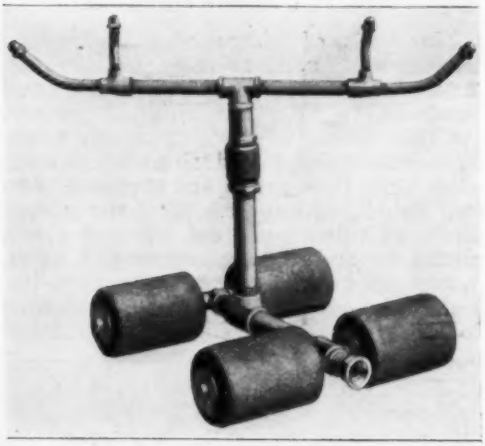
An eastern church committee was given the task of selecting a bell, and the chairman called a bell factory by long-distance telephone to arrange for a visit to the plant. While conversing, the tolling of different bells being tested was transmitted so clearly over the wire, that the chairman decided that the selection could be made without going to the factory. Accordingly the entire committee was assembled and each "listened in" on the demonstration, until one of the bells was unanimously chosen.

POLISHED METALS ANNEALED WITHOUT TARNISHING

By covering with a very thin film of boric oxide any polished article that has to be annealed, there will be none of the tarnish which results under ordinary treatment. The coating of boric oxide will resist temperatures up to 1,202° F., which is high enough to protect polished steel from any coloration when it is tempered. The coating is fireproof, does not evaporate, and dissolves any oxidized matter on the surface of the heated metal. It can be applied either as a powder or as a liquid. After annealing, the coating peels off, or may be dissolved in warm water. The process has been patented.

GOLF-COURSE SPRINKLER HAS RUBBER ROLLERS

Marring the turf of a golf course is always prevented if possible, and one of the latest of these preventives is a rotary sprinkler having rubber rollers, which allow it to be moved freely on the greens and fairways without injuring the soft sod. The sprinkler is 19 in. high, with an arm spread of 28 in., weighs but 14 lb., has connections for either ¾ or



Golf-Course Sprinkler, Showing the Four Rubber Rollers, Hose Connection, and Spread of Sprinkling Arms

1½-in. hose, and has a capacity of 15 gal. per minute over a 70 to 90-ft. area.

¶Portable altars will be installed in all the passenger steamers of the Cunard Line, according to late reports. During the busy tourist season, one large public room in each section will be set aside for Protestant services and Catholic masses.

Motor Truck Moving a 250-Ton Office Building, in Portland, Oregon: The Truck was Blocked, and a Winch, Driven by Its Engine and Mounted Just behind the Seat of the Machine, was Used to Move the Heavy Structure a Little at a Time

TWO-STORY OFFICE BUILDING MOVED BY MOTOR TRUCK

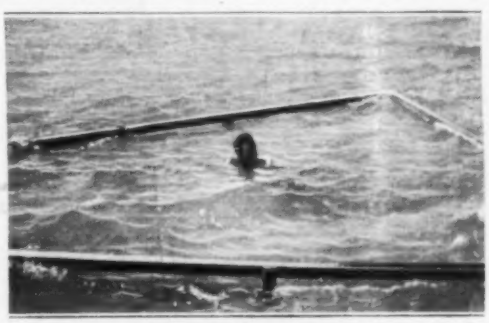
Moving a two-story office building without interrupting the duties of the employes therein, was accomplished recently in Portland, Ore., with the aid of a motor truck. The building is 40 by 80 ft. in size, weighs approximately 250 tons, and was to be relocated at a distance of 600 ft., in addition to being turned completely around. The workmen used a winch mounted on the truck, and driven by its engine, and thus slowly but surely moved the structure to its new location.

TO INVESTIGATE PROPERTIES OF ALUMINUM ALLOYS

Extensive investigations of the properties of light aluminum-alloy castings are being undertaken by the Bureau of Mines, and, when completed, will give exhaustive information on this important subject. The study will not be confined to the physical properties alone, but will deal with the subject of sand castings, die castings, and permanent mold castings. There will also be a discussion of the principal aluminum-alloy systems, such as aluminum copper, aluminum iron, aluminum manganese, aluminum zinc, and others.

SHARK-PROOF NET PROTECTS LONG-DISTANCE SWIMMER

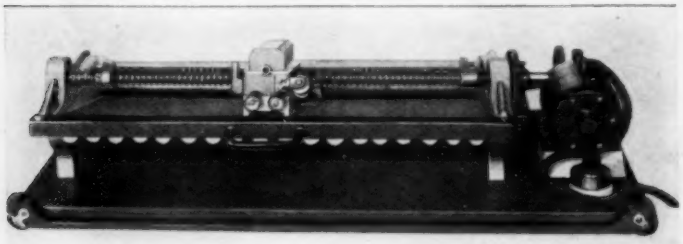
How to swim with safety in shark-infested ocean waters was demonstrated recently by a negro in Queensland, Australia, who insisted on swimming from Magnetic Island to Townsville, a distance of five miles, in spite of the sharks, and also of police interdiction. Indeed, it was only on account of the latter that he even deigned to take the precaution of surrounding himself with a floating wooden frame from which was suspended a shark-proof net, 6 ft. deep. The frame and net were towed by a launch, and the negro accomplished his feat without experiencing any interference.



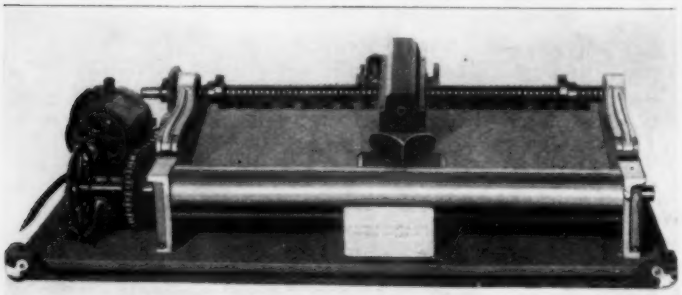
Australian Negro Swimming in Shark-Infested Waters: Suspended from the Floating Frame Is a Net, Six Feet Deep, Which was Towed Along as He Swam

PRINTING-PRESS ATTACHMENT FOR DISTRIBUTING THE INK

For the production of high-class printing, such as half-tone and color-process work, and of any ordinary printing with minimum spoilage, a machine has been designed that, when attached to the press, keeps the ink smooth, soft, and equally distributed. Placed in the fountain it has an adjustable blade that can be raised or lowered to turn any amount of ink desired. When in operation it scrapes the ink loose from the bottom of the fountain, and also plows it against the fountain roller, insuring even distribution on the duct roller. The blade is reciprocated by means of a drive screw which has an adjustment for any-size form. The blade is on a hinged frame which can be raised and moved out of the way when putting ink in the fountain. The attachment can be run by an individual motor or by gears from the press. It eliminates pressroom delay caused by stiff ink.



Rear View of the Printing-Press Ink Equalizer, as It Appears When Motor-Driven and with the Inking Knife in Operating Position



Front View of the Ink Equalizer: The Inking Knife is Automatically Reciprocated by the Threaded Spindle in Connection with It

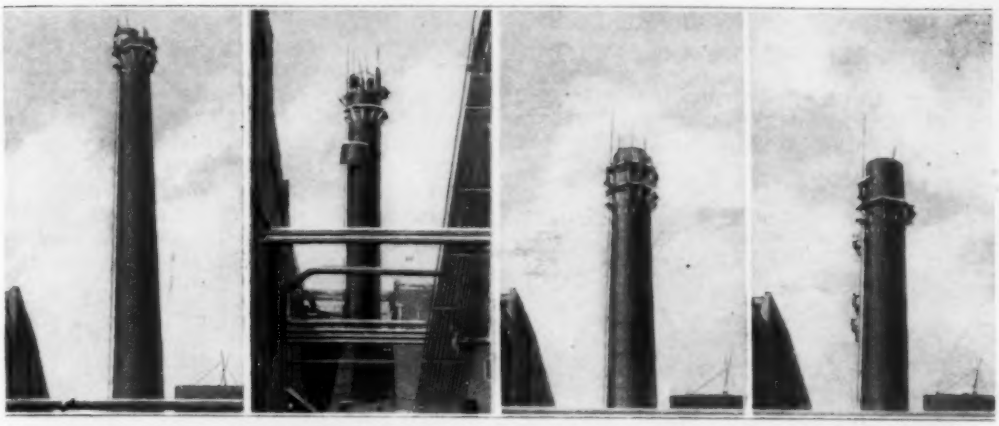
¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

ELECTROMAGNETIC RECOVERY OF COAL FROM CINDERS

In all furnaces to some extent—in some more and in others less—a certain amount of coal falls into the ashes that is only partly consumed by the fire. Considering the present high cost of coal, especially in Europe, it is not surprising that much interest has been attracted there to the efforts of a German inventor to separate this partly consumed coal from that which is entirely consumed. The method employed is based upon the fact that all coal contains a certain amount of iron pyrites, and that during combustion the iron in this compound becomes converted into an oxide and remains in the cinders. Iron pyrites, such as contained in the unconsumed coal, is not sensitive to magnetic attraction, but the iron oxide in the consumed coal is to a certain extent. Therefore, if sufficiently powerful magnetic attraction be employed to hold the completely consumed cinders, those only partly consumed will be allowed to escape and can be recovered by a simple separation process.

LETTER IS PLAINLY VISIBLE IN GLASS-BODY MAIL BOX

A very attractive mail box is being made in which the body is of glass. It can be fastened to the wall or other convenient point, and is so designed that the holding screws cannot be removed when the lid is locked. One advantage of this box is that the contents are always plainly visible. A spring clip is provided for holding papers or envelopes too large for the box.



From Left to Right: Beginning at Top to Wreck Old Worn-Out Steel Stack with Movable Platform around It; Wrecking in Progress, Showing One Plate being Lowered outside the Stack; Still Further Progress with Two Platforms in Place; Three Steeplejacks Climbing the Ladder to Platform on Stack

UNUSUAL MEANS OF WRECKING WORN-OUT STEEL STACK

An unusual exploit, done in an unusual manner, was the wreckage recently of a steel stack at an alkali plant in Ford City, Mich. The stack was 180 ft. high, 10 ft. in diameter, and self-supporting. It had been in use for 27 years, and the action of the heat and chemicals in the smoke had pulverized its brick lining, and had eaten away the steel so that the plates buckled and the rivets could be pulled out with the fingers. In wrecking the stack, a scaffold was erected inside it in order to carry a 6 by 6-in. pole. Two 20-in. platforms were placed around the outside of the stack, supported on brackets that were clamped to the stack by a cable tightened with a turnbuckle, thus making them movable. The brick lining on one tier of plates, which were 6 ft. 8 in. wide, was first lowered down the inside of the stack, and then each plate in that tier was taken off and lowered down the outside of the stack by means of the pole and a winch. The job was completed in six days by three steeplejacks above, and two laborers on the ground, without the slightest mishap.

ELEPHANTS ACT AS EXPERTS FOR TESTING FLOORS

Great confidence was recently placed in the popular tradition that an elephant will refuse to walk upon an unsafe structure. Wishing to determine the strength of his garage floor, a Canton, Ohio, man employed the services of five circus elephants to act as test load. They were led upon the floor and grouped as closely as possible, making a live load of more than 15 tons on the center of the floor—probably the first of this unusual description to be used for such a purpose.

Five Elephants from a Visiting Circus were Employed as "Safety Engineers" in Testing This Garage Floor. Grouped as Closely as Possible, They Represent a Combined Load of More than 15 Tons

WINDSHIELDS ON UPPER DECK FOR PASSENGERS' COMFORT

Many motor-bus patrons prefer to ride on the upper deck of the bus but are deterred during the winter months by the

The Big Windshield across the Front and the Individual Shields for Each Seat Make the Upper Deck Comfortable during the Winter Months

chilly winds. This has led a Detroit bus company to install windshields on the upper deck, and they have proved very successful. One big windshield extends across the front of the bus, and each seat is also equipped with an individual shield.

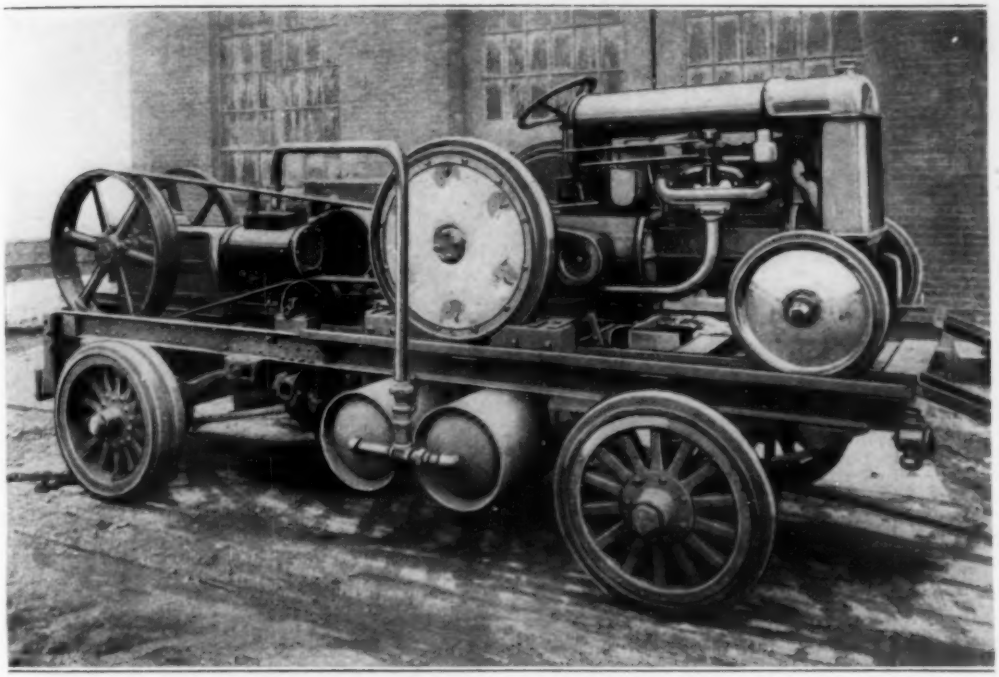
INERT GAS USED IN CANNING VARIOUS FOOD PRODUCTS

Ninety per cent of the present commercial canned food would be improved, it is claimed, by the complete elimination of the oxygen in the container. This has been known for some time, and various expedients have been adopted, such as venting the cans after heating and sealing while hot, but none has succeeded in removing more than from 50 to 80 per cent of the oxygen. For some nine years now a much more effective method has been under development, namely the substitution of inert gases for the oxygen. By the use of such a gas, canned coconut has been produced without any loss of flavor whatever. The inert gas used has been carbon dioxide, and an ingenious mechanical method has been developed by which the oxygen is removed by suction from large numbers of cans rapidly, and the vacuum is automatically filled with carbon dioxide. Packers are now considering the possibility of applying the process to many other products.

DEVELOP MANGANESE MINES IN ARGENTINA DESERT

The United States imports more than 500,000 tons of manganese ore a year. It is principally used by steel mills in the manufacture of the very hard manganese steels, and by glass factories in the manufacture of flint glass. It is also used in making electric dry batteries. Brazil has always been the great source of manganese, while India and Cuba are also important producers. Recently manganese mines have been discovered in Argentina, and an Anglo-Argentine company is developing the industry in that country. The Argentine manganese occurs in a single vein running for about 50 miles through the Santiago desert in the center of the republic. The greatest width of the seam is about 8 ft. The ore is about 75-per-cent pure manganese dioxide, and is claimed to be superior to the Brazilian. The mining is done by native Indians, who are paid an average of one peso per day, or the equivalent of about 33 cents. The ore is brought to the railway, a distance of 90 miles, in two-wheeled carts, carrying a ton and a half of manganese.

Left: The Manganese Vein Runs for Approximately 50 Miles across the Desert. Right: After the Ore is Mined, It is Sorted, Graded, and Sacked by Indian Women and Boys, and is Then Hauled a Distance of 90 Miles, to the Railroad



Motor-Truck Chassis with Air Compressor Mounted on the Left End: The Tractor on the Right End of Chassis is Used to Haul the Apparatus from the Garage to the Job, Where It Drives the Air Compressor during the Day, and to Pull the Truck Back to the Garage at Night

DOUBLE SERVICE OBTAINED FROM SMALL TRACTOR

"Killing two birds with one stone" is figuratively done with a small tractor which hauls a concrete-drilling outfit to the job, and then runs up on the chassis of the specially built truck, where it is belted to an air compressor. All day the tractor faithfully chugs away in driving the compressor, and at night it runs down from the chassis and obligingly pulls the apparatus back to the garage.

MAIL CARRIED BY DOG TEAM IN SOUTHERN CALIFORNIA

On a power-tunnel project in the high mountains of southern California, it was decided to keep the construction work going during the winter from both ends of the tunnel. The road connecting the two ends of the tunnel leads through a pass at an elevation of more than 9,000 ft., and is of course blocked with snow during the winter. In order that mail might be delivered regularly at the farther camp, a team of seven Alaskan dogs is employed, and under favorable conditions can take a load of 500 to 600 lb. over the route.

ESKIMOS' WHALING BOATS ARE AMERICAN-BUILT

The boats used by the Eskimos of Alaska, as described and elaborately illustrated in "Whale Hunting on the Top of the World," in the February issue, are all American-built. Many of them are built at New Bedford, Mass., and are shipped from there, by way of the Panama Canal, to the Arctic regions. The

Whaling Boats for the Eskimos of Alaska on Their Way to the Steamer Which will Take Them, via the Panama Canal, to the Arctic Regions

boats are not needed in large numbers, and this year's shipment from New Bedford thus far consists of only four boats.

"The Castle" Built by the Artist with the Help of One Man: The Structure Is of Brick and Concrete, and was Built in His Spare Time during the Course of Eight Years. There Are Many Examples of Concrete Sculpture in the Building

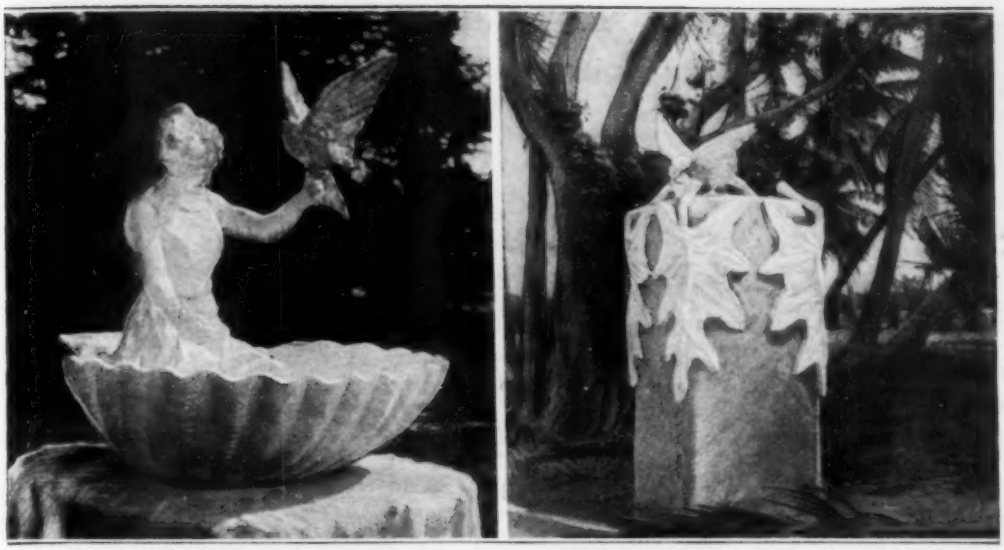
DECORATIVE EFFECTS IN MOLDED CONCRETE

When one speaks of concrete, it conjures up visions of retaining walls, severely plain buildings, and massive bridges, but T. A. Brouwer, of Westhampton, N. Y., has shown that this material is admirably adapted for artistic work. On his estate, called "Pine-Wold Park," are many examples of his art, in the form of statues, fountains, and the like. In some instances, it seems almost impossible that such delicate figures and designs could have been made of concrete, yet such is the case, and the artist contends that it is a very easy matter to make them.

"The Soul of a Rose:" The Figure of a Butterfly-Woman Bending over a Wild Rose, Molded of Concrete over a Wire-Mesh Frame, Shows the Delicate Effects Produced by This Method

In making a statue, for example, he first makes a frame of light iron pipe, or heavy wire, which conforms to the general lines of the figure and is really the skeleton on which it is molded. Over this frame, a wire-mesh form is molded by hand along the general lines of the figure. This mesh form is made of ¼-in. galvanized-wire netting and serves as the foundation for the concrete. A mixture of one part cement to two parts sand is used, and is placed and molded by hand. After the general outlines of the figure are formed, the excess material is cut away and the finishing coat of cement is applied with a brush. When this has set, the figure is finished by chipping and working over with a fine chisel.

This method is not limited to statuary but can be applied to decorative effects for buildings, cornices, fireplaces, and also for



Left: A Fountain of Molded Concrete, in Which the Large Shell was Shaped Out of a Single Block as the Material was Setting, the Figure being Built Up on a Frame of Iron Pipe and Wire Mesh. Right: Decorative Pier, Seven Feet High, Cut from a Solid Block. The Bird on Top of the Pier is Molded over a Wire-Mesh Frame

many other purposes. The work can be done very rapidly and the decorative effects are limited only by the skill of the sculptor. The artist has been able to produce various color effects in his work by the proper blending of the material used. Some of his groups of statuary are given a finish similar in appearance to antique bronze, which is very effective against the forest setting in which they appear. Contrasting effects are produced by placing white relief figures or designs against a background of gray or darker color.

BEEHIVE GATE PASSES ONE BEE AT A TIME

An interesting problem has recently been brought to the attention of the Bureau of Standards by the Bureau of Entomology. In studying the habits of bees they desired to learn the number of bees leaving the hive during the day, so a gate was devised which would permit only one bee to pass at a time, and an arrangement was made whereby the number of bees was counted automatically. The little counting device which is used for registering the number of telephone messages on a given instrument was employed as a recording device. A series of these registers were installed in such a way that the number of bees passing the gate was recorded. As only alternating current was available where the counting was done, it was found necessary to find means of operating the counters on current from rectifiers. Current from batteries could not be used on account of the great number of times the gate would operate during the day, as many as 300,000 exits per day being expected.

Another View of the Fairy Figure Whose Wings Are of Concrete, Modeled and Shaped by Hand, While It Is Still Plastic, over a Frame Made of Stiff Wire

ROLLER CURTAIN IS MOUNTED ON BOOTBLACK STAND

Feminine customers showed so much embarrassment while having their shoes shined, that a sympathetic New York

Bootblack Stand with Roller Curtain, Enabling Women Customers to Protect Themselves against Annoyance from Passers-By

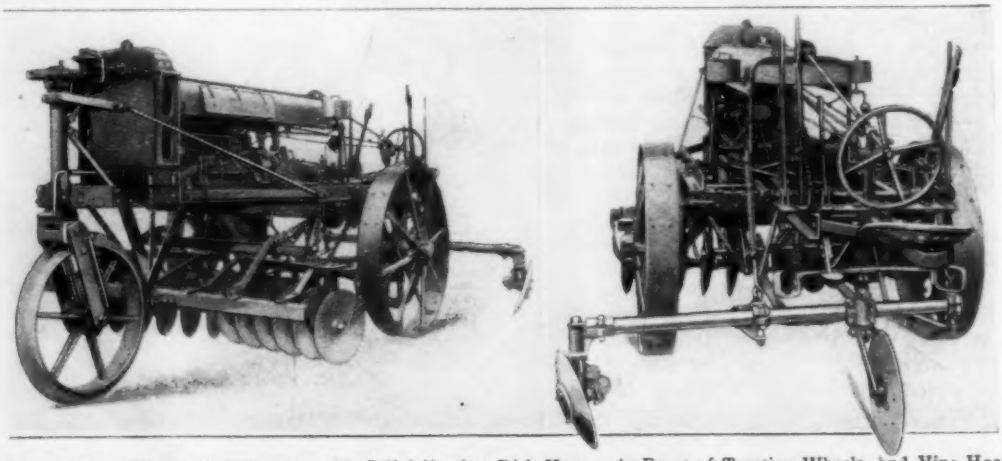
bootblack mounted a roller curtain on his stand. Now the wearer of the most abbreviated skirt can pull down the curtain to suit herself, and sit unconcernedly in the elevated chair for a "shine" without being annoyed by the interested glances of the rude passers-by.

SUBSTITUTES FOR PLATINUM PROVE SATISFACTORY

In a search for a substitute for expensive platinum, various alloys have been tried and some have been found satisfactory for different purposes, although no general substitute has been evolved. One combination, known as "palau," resists the activity of most of the reagents, while another, called "rhotanium," is claimed to make a good substitute for electrical-heating units.

MOTOR VINEYARD CULTIVATOR OPERATED BY ONE MAN

As an economizer of time and labor a motor-driven implement has been designed to furnish in one machine a complete equipment for vineyard cultivation. With only one operator, and one operation, it will both harrow the rows and hoe the vines. It can also be used as a tractor for hauling a three-base vineyard plow, and as in the case of ordinary tractors, it can be used as a stationary power plant. Its motor is of the tractor type, with a three-speed selective gear transmission, all mounted on a three-wheeled chassis, and between the front steering wheel, controlled from the driver's seat, and the traction wheels in the rear is a regular disk-harrow equipment, with 12 disks, which is controlled by the operator's feet. Behind the traction wheels is the attachment that hoes the vines. When turning, either of the traction wheels can be left stationary while the other is revolved, causing the cultivator to turn in either direction within a 10-ft. radius.



Motor-Driven Vineyard Cultivator, with Self-Adjusting Disk Harrow in Front of Traction Wheels, and Vine Hoe behind Them: The Driver Sits at the Rear, and with the Large Steering Wheel Operates the Front Wheel

Above: The Raft and Derrick are Towed from Place to Place by a Tug. Right and Left: Two Views of the "High Lead" Used in Removing the Felled Timber from the Steep Bluffs

THERMOMETER HOLDER ON BED IS HANDY AND SANITARY

Clamping to the bed a small metal holder containing a glass tube, in which can be inserted the ordinary thermometer, or fever register, of the sick room, is the latest method used in hospitals. Following this procedure, there is slight chance of the thermometer being interchanged with that of another patient, or mislaid, thus furnishing a sanitary innovation for the care of the sick.

USE HUGE FLOATING DERRICK IN LOGGING OPERATIONS

Efficient logging of many wooded islands and steep headlands of the British Columbia coast was a problem that long baffled Canadian timbermen. The solution has been found in a floating logging camp, consisting of a pile driver, donkey engine, and derrick, all assembled on one raft which is towed from job to job. The raft is built of huge logs, and is 106 ft. wide and 130 ft. long. The two upright timbers form what is known as a "high lead." Cableways from the high lead into the forest areas provide means of rapid transportation of logs to sea level. The sticks forming the uprights are each 126 ft. long, 6 ft. in diameter at the base, and 34 in. at the top. A seagoing tug tows the raft to islands and rugged coasts where customary methods are not applicable.

The raft is placed on the beach and anchored with piling, and guy wires are fastened to the shore. The ordinary high-lead system of logging is then used to swing the logs to the shore, where they are piled like so much cordwood, half submerged in water, to form rafts.

ELECTRIC WINDOW RADIATOR IS FROST PREVENTER

Formation of frost on windows can be prevented by the use of an electric radiator, which was designed expressly for this purpose. The appliance consists of a small metal frame extending below the window, mounted on metal supports and containing a heating element. Connected to any light socket, the apparatus gives sufficient heat through its perforated sides to keep the glass clear on the coldest days.

Electric Window Radiator Placed in Position to Prevent Frost from Forming on the Plate Glass

HANDY INHALATION OUTFIT OF NEW DESIGN

Inhalation outfits are numerous, but one of new design consists of a specially constructed mask of rubber, to

Inhalation Outfit, Showing the Bottles of Liquids to Which is Attached the Rubber Tube Leading to the Special Rubber Mask That is Placed over the Nose.

which is attached a tube of the same material. The tube is fastened to bottles containing liquids, which, when inhaled, are transformed into dry gases, and are said to afford relief to the organs of the respiratory tract, when afflicted.

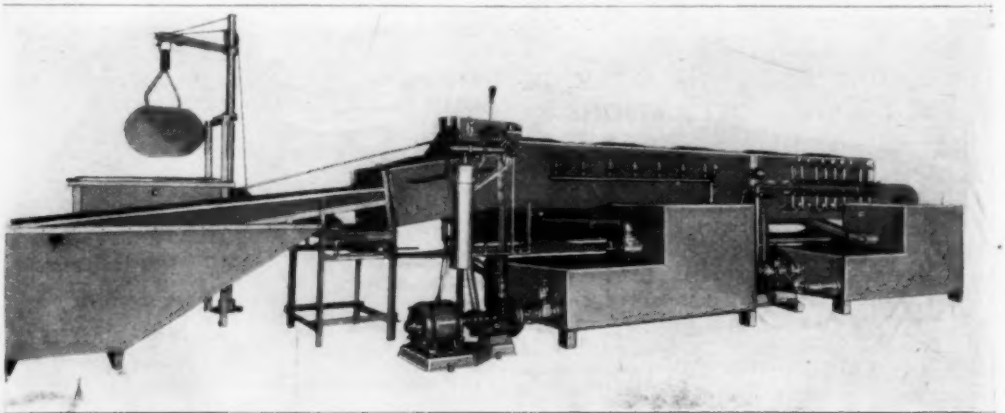
¶Under the terms of the Leasing Act, royalties of more than $2,000,000 were paid during the year 1921 for oil and gas produced on government-owned land in the West.

PERSONAL HEATING POSSIBLE IS THEORY OF ENGLISHMAN

Giving as an illustration the pleasing effect produced throughout the body by holding anything warm in the hands, or by immersing the hands in warm water, J. W. Beauchamp, director of the British Electrical Development Association, recently suggested the possibilities of personal heating. According to his theory, in the future, instead of seeking better means of heating the atmosphere within buildings, an effort will be made to heat the bodies of the occupants of these places by individual electric devices, thus leaving the air as fresh as on the outside. The lecturer also thought that science would soon discover a method whereby merely the presence of some small heating medium about the person would provide sufficient heat to make anyone comfortable.

NEW FRUIT-PEELING MACHINE USES CAUSTIC-SODA VAPOR

Fruit canners now have available a new peeling machine which is said to reduce the amount of lye used by half, greatly improve the color and flavor of the product, and effect a saving of approximately 50 cents per ton. With the improved apparatus, the fruit is placed on a conveyor belt, preheated, and then run for about 30 seconds through the vapor of caustic soda, which loosens the peel. Then, without being touched by hands, the fruit passes along between sprays of water which wash the peel off, and which can be carefully regulated according to the condition of the fruit.



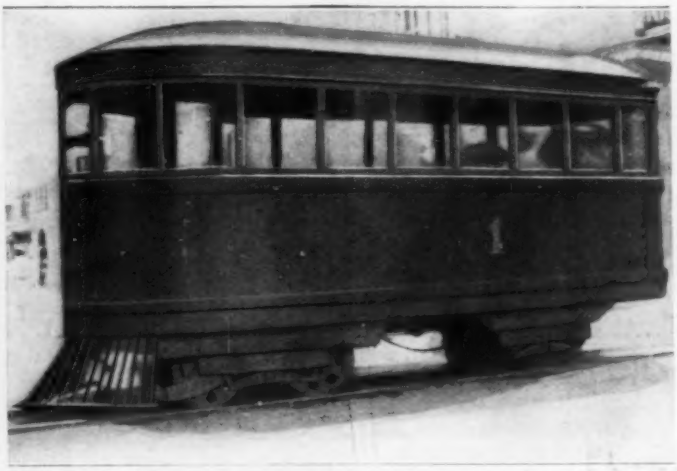
Fruit-Peeling Machine Erected and Ready for Operation in a Canning Plant: The Fruit is Placed on a Conveyor Belt at the Left End, Passes through the Machine without being Touched by Hands, and Emerges at the Right End Thoroughly Peeled and in Readiness for Canning

TANKS USED TO DESTROY STILLS CAPTURED IN RAIDS

NEW uses are constantly being found for tanks, but one of the most unusual was the reduction of some "moonshine" stills to a condition of junk. During a recent clean-up campaign in Newport, Ky., more than 50 of these illicit stills were taken and were then destroyed by driving two tanks over them. The wreckage was later sold as junk.

HAITIAN STREET CARS BUILT FROM AMERICAN AUTOS

Street cars, built from American automobiles, are being operated in Port au Prince, the capital of Haiti, with great success. The complete chassis, motor, and transmission were used, except that the gearing from the original rear axle to the 32-in. drivewheels was reduced, so that the axle and wheel sprockets are the same size. This greatly increased the available power. The cars weigh 7,250 lb. and can attain a speed of 40 miles an hour. They have proved so successful and economical that the sugar company, which operates all the street cars and railroads of Haiti, contemplates using similar cars to haul sugar, in place of the old steam locomotives which consumed so much coal.



One of the Street Cars, Used in Port au Prince, Haiti, Which were Built from American Automobiles, Using the Complete Chassis and Power Plant: They have Proved a Great Success in Solving the Transportation Problem and may be Adopted Also for Railroad Traffic

PROJECTILE POCKET PISTOL IS LIFE-SAVING APPLIANCE

In case of shipwreck, a few minutes' delay in sending a line to the vessel may mean life or death to those on board. A line-throwing rocket pistol has now been devised which, with all equipment, weighs less than 50 lb., and is easily portable. The pistol is fired from the hand. A small cartridge projects the rocket from the barrel of the pistol and ignites the charge in the rocket, which then becomes self-propelling, carrying the line in the direction required. A length of flexible wire connects the line to the rocket.

Above: Two Steel Boxes Hold the Complete Outfit. Below: Left, Inserting the Firing Cartridge in the Pistol; Right, Inserting the Self-Propelling Rocket with Line Attached

LARGEST FELT-WEAVING LOOM EVER CONSTRUCTED

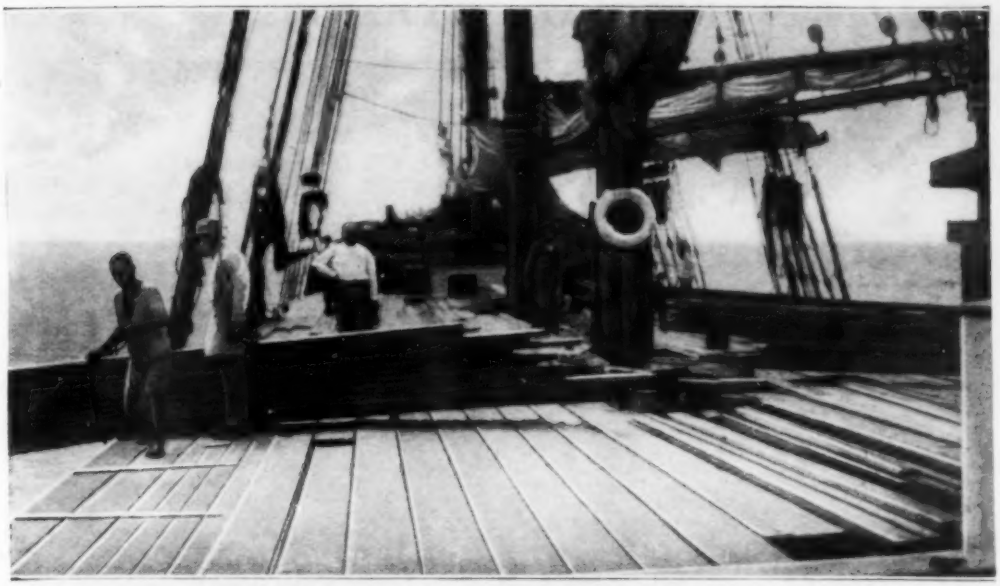
A felt loom, said to be the largest of its kind ever constructed, has recently been completed at Worcester, Mass. The loom is for weaving continuous tubular paper-makers' felts, up to a width of 40 ft. The finished machine weighs 18 tons, and will require two freight cars for its shipment.

TRANSMISSION LINE TO SPAN STRAITS OF MESSINA

Industrial expansion in Sicily demands the introduction of more electric power, and a 120,000-volt transmission line has been proposed, which will come from Italy by crossing the Straits of Messina. The span would be 3,770 yd., or about 2¼ miles, and the cables of nickel or zinc-plated steel, each cable being supported on individual masts. These masts would have to be 900 ft. in height, to provide a 150-ft. clearance for passing ships in the center of the estimated 660-ft. sag. At present the most difficult feature of this huge engineering problem seems to be the construction of strain insulators which will be strong enough to hold the vast weight of the steel cables. However, if this contemplated project can be realized, Sicily will receive approximately 50,000 kw. of power for manufacturing purposes of all kinds.

MUSSELS ON SHIP BOTTOM CAPTURE SMALL FISH

Capturing three fish about the size of sardines was the curious exploit of as many sea mussels, which had attached themselves to the iron bottom of the famous exploration ship, the "Albatross," of the U. S. Bureau of Fisheries. This vessel had lain in San Francisco Bay for some time when it was decided to condition it for sea duty, but it was found necessary first to put the ship in drydock to clean the hull of the mussels. On the 30-mile trip to the Mare Island Navy Yard, the vessel must have passed through a school of anchovies, for several of these fish were found entangled on its bottom, and three were held firmly by the head in the shells of the mussels. This curious phenomenon must have been purely accidental, as neither the fish nor the mussels were capable of eating the other.

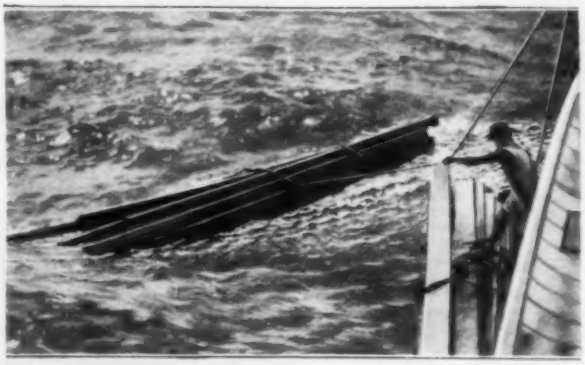


Because of the Danger from Heavy Surf, the Schooner Anchors About a Mile Off Shore, Where the Lumber is Made Up into Rafts. These are Cast Overboard, to be Towed Ashore by a Small Launch Which can Venture Close to the Surf without Fear of being Damaged

HOW KAUAI IN THE MID-PACIFIC GETS ITS LUMBER

THE demand for lumber for building and other purposes in the Hawaiian Islands is enormous, and owing to the fact that neither hard nor soft woods can be produced in commercial quantities, the islands have to depend entirely upon importations. Because of the lack of harbors on the island of Kauai, interesting and somewhat primitive means of landing a cargo have to be resorted to.

The lumber schooner anchors about a mile from shore, beyond



The Rafts are Assembled at the Side of the Schooner Until the Launch Is Ready to Start for the Shore

The Rafts are Arranged on Both Sides of the Launch Ready for Towing, and a Harness is Passed over the Bow of the Launch in Such a Way That the Rafts can be Cast Off by Reversing the Launch

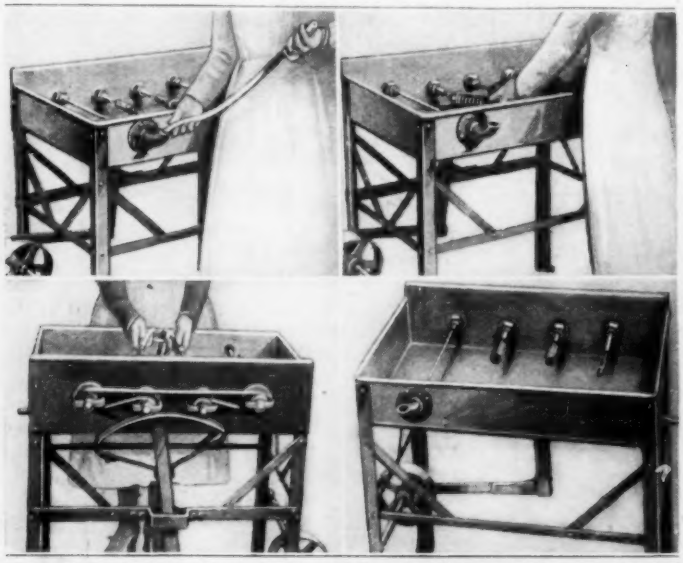
the breakers, and the lumber is made into rafts and jettisoned into the shark-infested ocean. The rafts are secured by the natives and lashed together. They are then "harnessed" over the bows of a motor launch, and the craft proceeds shoreward with its load of about 10,000 board feet. On approaching the shore, the rafts are cast off, and the launch goes astern, while Hawaiians,

After the Rafts are Cast Off by the Launch, Expert Swimmers Come Out from the Shore and Secure Them to Buoys Until They can be Warped Ashore and the Lumber Hauled Up on the Sandy Beach, Where It is Soon Dried by the Tropical Sunshine

who are notoriously good swimmers, swim from the shore, secure them to buoys, and warp them to the sandy beach. The lumber does not suffer from its immersion, and it is creditably reported that this is the only place in the world where such means of landing a cargo have to be resorted to.

MILKING-MACHINE WASHER IS RAPID AND SANITARY

Milking machines must be washed after every period of use, to prevent their becoming sour and insanitary, and a washer which does this work rapidly and efficiently has been produced by an eastern manufacturer. The machine consists of four cleaning brushes, two for milk tubes and two for teat cups, the whole being attached to pulleys belted to an electric motor or other source of power. These brushes revolve at a high rate of speed, two revolutions to the right and then two to the left, and are constantly immersed in a container filled with an antiseptic, or sterilizing, solution. It is said that the reversing action of this machine insures a longer life to the brushes than is the case with the usual rotating washers, and that the apparatus is so simple a child can operate it effectively.



Upper Left: Placing Long Rubber Tube of Milking Machine on Special Brush. Upper Right: Washing Teat Cups. Lower Left: Cleaning Short Rubber Tubes. Lower Right: Four Brushes of Washer, Illustrating the Different Sizes and Shapes Required to Properly Clean the Milker

¶Several trial gas installations for cooking in Canal Zone quarters are to be made by the Panama Gas Company. Mains have been laid from Panama and the laying of pipes is now going on.

Above: A Two-Cylinder Gasoline Engine Furnishes the Power for Driving the Tractor Belts Which are Provided with Wooden Cleats. Right: Passengers and Operator Ride on the Toboggan and the Power Unit Propels It by Pushing from the Rear

TRAVEL SNOW-COVERED ROADS WITH MOTOR TOBOGGAN

A motor toboggan has been invented by a Maine man which is expected to solve most of the transportation problems in localities subject to heavy snowfalls during the winter. The passengers and operator ride on the toboggan, at the rear of which the power plant is fastened by a flexible connection. Power is supplied by a 15-hp. engine which drives the tractor tread, consisting of a rubber belt equipped with metal or wooden lugs. Trials have shown that a speed of 30 miles per hour can be attained. Fuel consumption is at the rate of 45 miles to the gallon of gasoline. The weight of the toboggan, in passing over loose snow, packs it so the treads have a firm grip.

NEW YORK APARTMENT HOTEL WILL HOUSE A CHURCH

That the bright lights are not the attraction for all visitors to New York is shown by a recent announcement that an apartment hotel is to be built, in which part of the three first floors will be occupied by a church. The church-hotel will be 17 stories high, with the usual hotel lobby on the first floor. The church will have a separate entrance on the first floor and will occupy most of the space up to the level of the fourth floor. The remaining floors will be arranged for hotel accommodations, divided into suites of not more than four rooms and bath, with single rooms for transients.

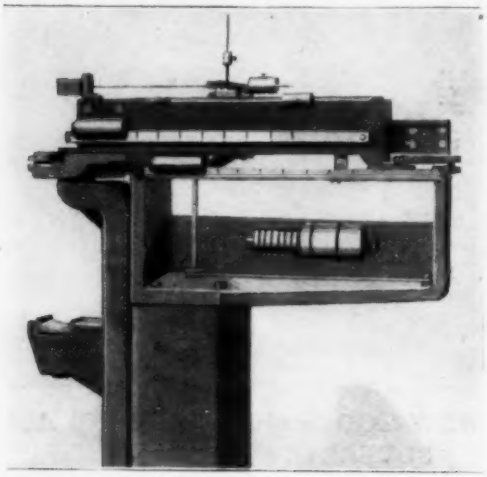
NEW TOOTHBRUSH CLEANS ALL SURFACES OF THE TEETH

In one form or another there have been toothbrushes almost as long as there have been teeth, but hitherto in all forms it has always been necessary to replace them from time to time. Now there is a new form of toothbrush that is almost everlasting, only a small part of it having to be renewed. This renewable part is a small attachment that holds the bristles of the brush in a semicircular ivory frame that is rotatively connected to one end of a metal handle, so that it will move into any position that best suits the form of the teeth. The points of the bristles are semicircular like the frame, and straddle the teeth, cleaning the top and both sides.

Toothbrush with an Everlasting Metal Handle, and a Renewable Semicircular Brush Attachment

AN IMPROVED FORM OF SCALE WEIGHS RUBBER TIRES

In the manufacture of rubber tires, just sufficient rubber should be supplied to fill the mold, and any excess used results in waste. By weighing the tires on their metal cores before they go to the molds, the exact amount of rubber required can be determined. To do this accurately a scale has been devised which has a short arm projecting from one side, on which the tire is hung and weighed just before going to the mold. The scale is designed to maintain its accuracy under rough usage, and the usual knife-edges are replaced by metallic spring plates.



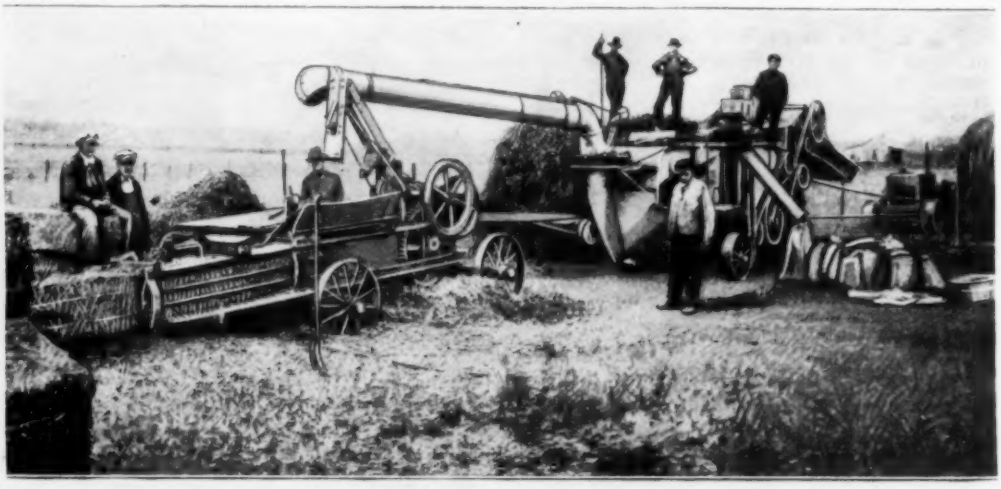
The Short Metal Arm Replaces the Usual Platform and is Used for Weighing Rubber Tires on Their Metal Cores

AUTOMATIC AND SHUTTLELESS LOOM MADE IN ENGLAND

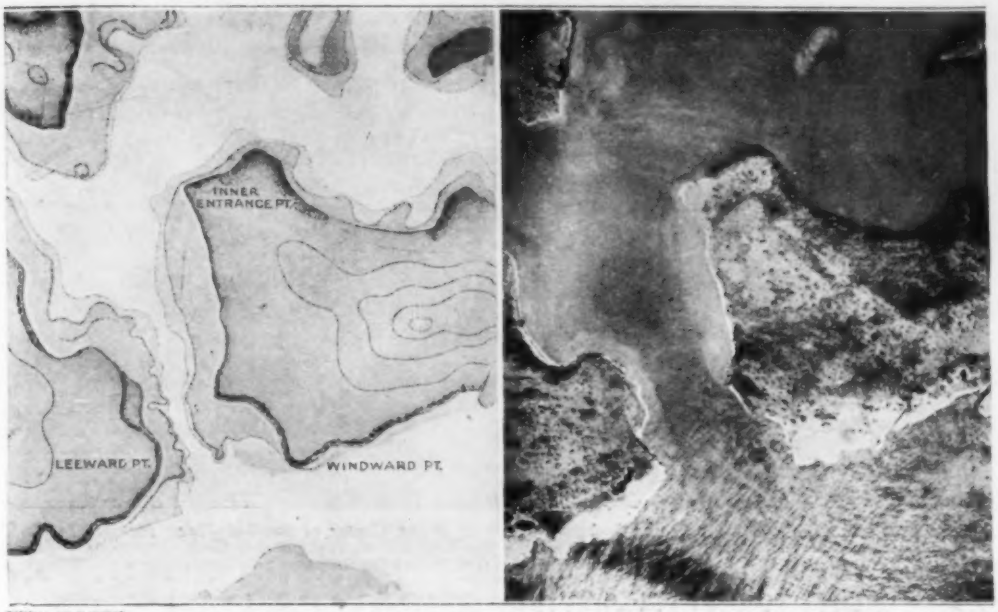
A new automatic shuttleless loom, which its English inventor claims will revolutionize the cotton-manufacturing industry, is reported now ready to be placed on the market. It is said that this loom weaves automatically cloth better in appearance by 25 per cent, and with about double the production of existing looms. Two different kinds of yarn, or two different counts, can be put in for effects, and with the attachment of a simple color mechanism, 6 to 10 colors can be put in by the same plain loom. It is also claimed that waste is reduced to practically nothing.

COMBINED THRESHER-BALER SAVES TIME AND MONEY

Threshing peas and baling the pea hay in one operation is possible with a machine which has lately been introduced by a Missouri farmer. The implement is placed beside a stack of the hay in the usual manner, the peas are threshed and come out of a spout into waiting sacks, while the hay is carried through the wind stacker and dropped on the baler. The whole is driven by a tractor of 10-18 hp., a belt from an extra pulley on the wind-stacker shaft furnishing the power to operate the baler. With all parts of the outfit placed in a position to reduce the labor of handling to a minimum, it is said that a considerable saving of time and money can be effected, thus making the machine a valuable aid on the farm.



Combined Thresher-Baler, Showing the Manner of Placing the Units to Reduce Labor: At the Extreme Right is Seen the Tractor Belted to the Thresher, While at the Left is Shown the Baler Also Belted to the Thresher



OFFICIAL NAVY PHOTO

Left: The Hydrographic Map is Made by Surveying the Land and Making Soundings of the Water Near By. The Areas of Water of Different Depths are Shown by Different Shadings. Right: The Airplane Photograph of the Same Locality in Which the Areas of Shallow Water Appear of Lighter Shade than the Deep Water. The Photograph is Used to Check the Survey Map and to Discover Changes

CHECK HYDROGRAPHIC SURVEY BY AERIAL PHOTOGRAPHS

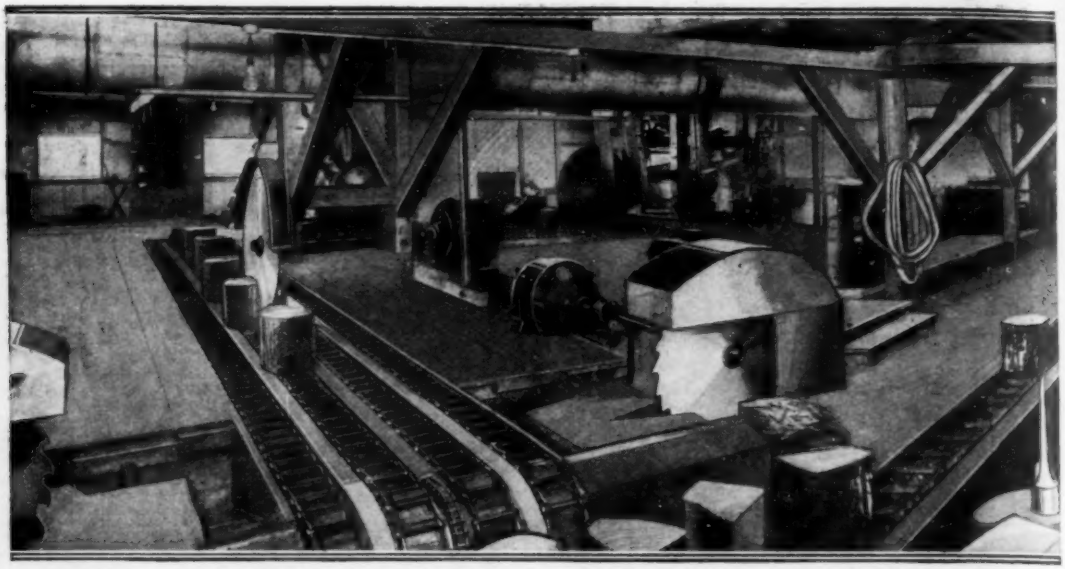
It has recently been demonstrated that aerial photographs can be used as a simple and satisfactory check on hydrographic maps. The map shows the land and the depth of the water around the land, the areas of different depths being represented by different shadings. A photograph of the same locality, taken from an elevation of 5,000 ft., will provide a ready means of checking the data on the map, as the areas covered by shallow water will appear of lighter shade than the deeper water. If radical differences are noted, such as a change of a deep channel, or new shoals appearing, a new survey becomes necessary.

FISH-MARKET SURVEYS MADE BY BUREAU OF FISHERIES

Surveys of the larger cities of the United States to ascertain their fish distribution and consumption are being made by the Bureau of Fisheries, which issues bulletins on the subject that are of great value to the commercial-fishing industry. A survey has already been made of the Chicago market, and a more recent one of the Twin Cities of St. Paul and Minneapolis. There the fish supply comes mainly from the Canadian lakes to the north, and from the North Pacific coast. A total of 86 carloads of fish, besides 21 of oysters, weighing 2,841,212 lb., was received in the Twin Cities during the year ended Sept. 30, 1921. These fishery products were handled by 360 firms, of which 11 are in the wholesale business, 5 in the wholesale and retail business, 32 in the retail business handling fish every day, and 312 handling it part of the week.

AUTOMOBILE ASH RECEPTACLE CONVENIENT FOR SMOKERS

Conveniently mounted on the dash of an automobile for smokers in the front seat, or on any side wall, or other flat surface for those riding in the rear seats, is a new device that acts as an ash receptacle and a cigar and cigarette case holder. The ash container has a lid that flies open at the touch of a button, and when open has a winged apron that prevents ashes from blowing into the car.



Panoramic View of Shingle Mill: In the Background, About at the Center of the Left-Hand Picture, Is the Log Slip to the Splitting Saws. Near the Knee Bolters at the End of These Conveyors, in the Immediate and Passes the Prepared Log Sections to the 14 Shingle Machines

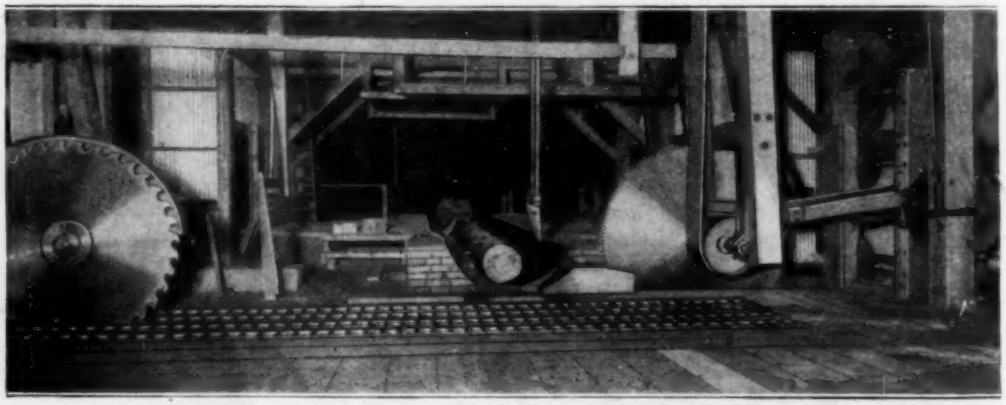
MILL CUTS 500,000 SHINGLES DAILY

By HENRY C. COPELAND

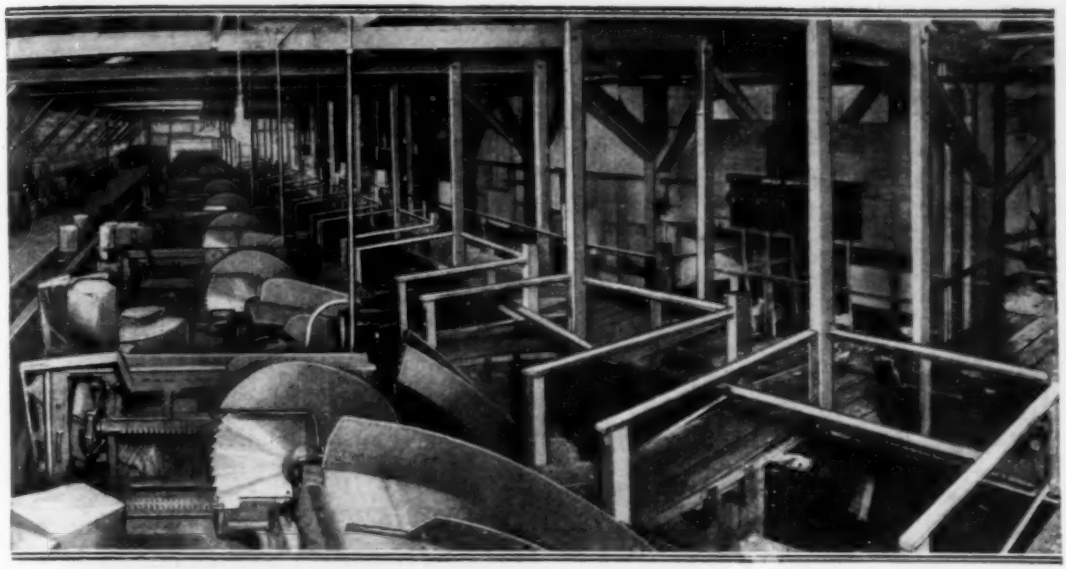
IT is a far cry from the days when the pioneer went forth with his frow and mallet to split cedar shakes with which to cover his roof, to the shingle mill recently put in operation at Vancouver, B. C., which cuts 500,000 every ten hours.

The cedar logs, ranging all the way from 1½ to 6 ft. in diameter, are floated to the foot of the log slip. There one end of a log is caught by the dogs on an immense endless chain and the log is drawn up the slip, other dogs engaging it as it goes up. If the log is not in the right position as it comes to the end of the slip, there is an overhead canting device which lowers a heavy wire cable and hook, by means of which the log is turned to place. Just to the right of the end of the log is a swing, circular cut-off saw 7 ft. 2 in. in diameter.

The saw is automatically set to cut 16, 18, or 24-in. lengths from the log; a thrust on a lever, and the saw is forced against the log. If the log is too large for the saw to cut off entirely, another lever is pulled, and an ax comes down and splits off the part sawed, whereupon the canter rolls the log for another cut. This operation is continued until the first length is cut completely free from the log, when the latter is moved ahead for another cut.



At the Right Is the End of the Log Chute by the Side of the 86-Inch Cut-Off Saw. To the Left of That Are the Steam Ax, the Control Levers, the Log Slip, and the Chain Conveyors, with the First Splitting Saw at the Extreme Left



and the 86-Inch Cut-Off Saw. To the Left of This Are the Chain Conveyors in the Floor That Carry the Cut-Off Logs Foreground, Is Another Conveyor at Right Angles, That Extends the Whole Length of the Mill, to the Right of It. At the Extreme Right Is the Filing Mill

The blocks fall onto a chain conveyor in the floor, and a workman with a pickaroon centers it so that the first splitting saw halves it. As the block arrives at the end of this conveyor, another man switches it onto another conveyor running at right angles to the first.

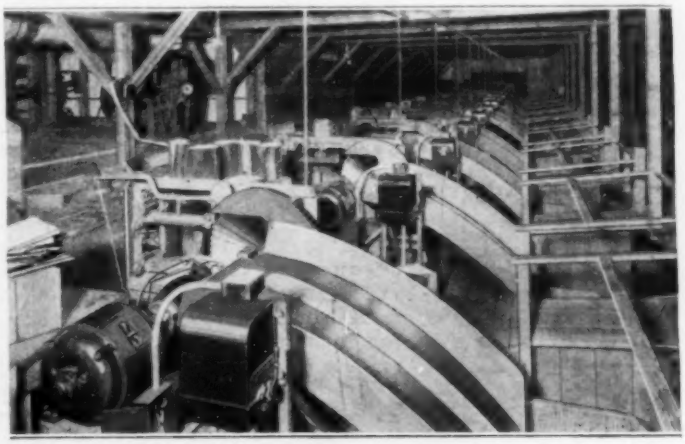
If the blocks are so large that they need splitting again, they are centered on this conveyor and again split. They next arrive at the knee bolters, where they are trimmed of all bark and rotten spots ready for the shingle sawyers. The knee bolters work in a pit, so that the blocks do not have to be lifted. From the bolters they are placed on the conveyor and passed along to the 14 shingle machines. The conveyors from the cut-off saw to the splitters and then to the knee bolters give more efficiency with three men than was obtainable with 10 under the old system.

The prepared shingle blocks are placed in the grip of the shingle machines and are automatically sawed into shingles. The operator takes the shingles as they fall and "joints" the edges on a small saw in front of him. They are then tossed down the chute to the packer, or "weaver."

As each bundle is packed, it is placed on a gravity conveyor, and by means of these conveyors and other live conveyors, is carried to the trucks ready for the dry kilns. The trucks go into one side of the kilns and out at the other, then to the repacker and into the car.

FIND INDICATIONS OF POTASH WHEN DRILLING FOR OIL

While drilling for oil recently in Texas, the drill passed through strata which showed a considerable amount of potash. Unfortunately the samples taken did not give complete information as to the thickness of the deposit. Further investigations are now in progress which may develop new potash areas at a considerable distance from all known Texas deposits.



Row of 14 Shingle Machines, Showing the Chutes Down Which the Finished Shingles Slide: The Saw at the Right of the Machine Cuts the Shingles. Each Machine is Driven by Two Motors

ORDINARY RECEIVERS USED WITH NEW AMPLIFIER

Any standard head set may be attached to branches of a new radio amplifier, and held in position by two knurled screws, which are rubber-covered to prevent damage to the receivers. As a rule, persons who buy amplifiers generally have a head set which is thereafter not needed, but with this new loud speaker, the old instruments can be utilized. The sound from the two receivers of matched tone is usually greater and less distorted than when but one is used.

FREIGHT AND PASSENGER-CAR HIGH-POWER STAFF BRAKE

For both steam and electric roads, a new type of hand-brake drum is an improvement over the old simple staff hand brake. In place of the plain winding staff is a grooved winding drum. The radius of the drum is large at the upper end, to provide for quick take-up of the brake chain, and tapers down to the lower end. The drum has a winding power about 2½ times that of the plain staff.

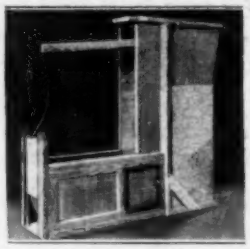
¶Parisians are discussing the erection of a memorial in honor of the dogs employed in the French army, which were killed in service in the late war, being the first nation so to honor these faithful animals.

COURT HOLDS THAT JAPANESE BORN HERE MAY OWN LAND

A decision recently handed down by a California court holds that Japanese born in this country are entitled to own land here. This is the first decision of this kind in California and is based on the Constitution of the United States, which says that all persons born here are citizens. In the case cited, the Japanese father advanced money to his children, who were born here, for the purchase of land. It is hard to say what will be the effect of this decision in California, with its 100,000 Japanese population.

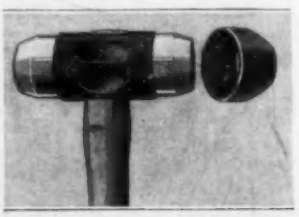
RATS CAUGHT AND DROWNED IN NEW-STYLE TRAP

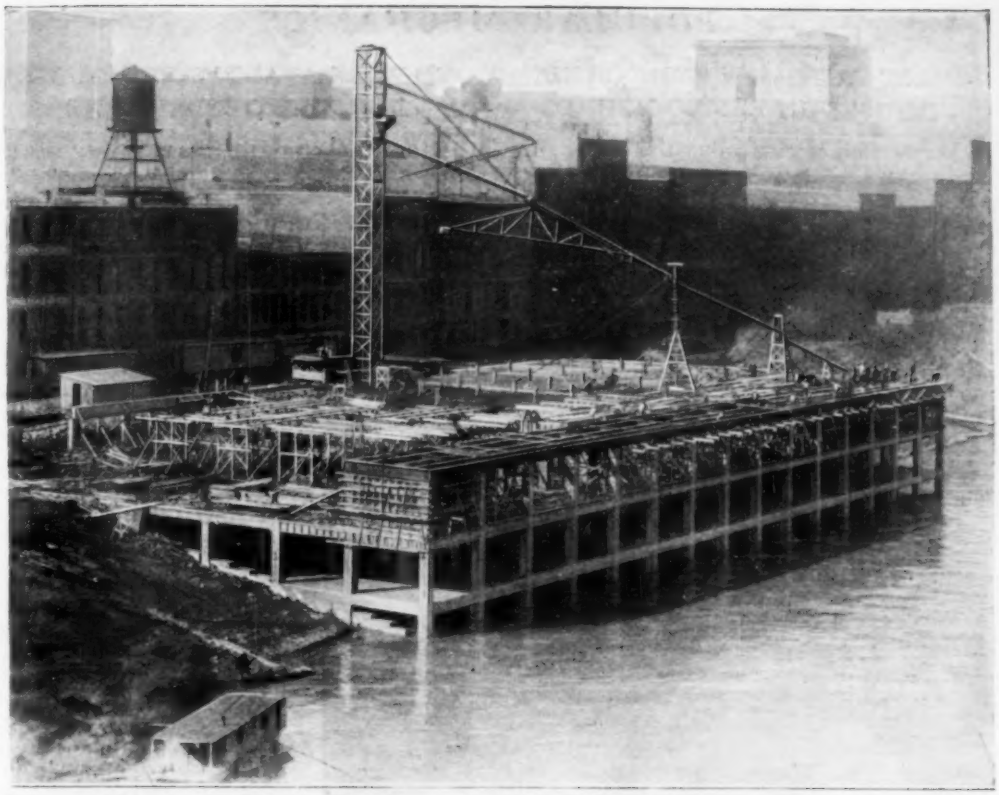
Catching and drowning rats at the same time is accomplished with a trap of late introduction. The trap is built in the shape of a perpendicular "L," and has a small screened runway through and up which the rodent must crawl to get near the bait. When the rat arrives at the top of the runway and strives to reach the tempting cheese, bacon, or other bait, the animal is precipitated into a galvanized-iron tank filled with water, and drowned.



SOFT-FACE FLOGGING HAMMER HAS MOLD FOR REFACING

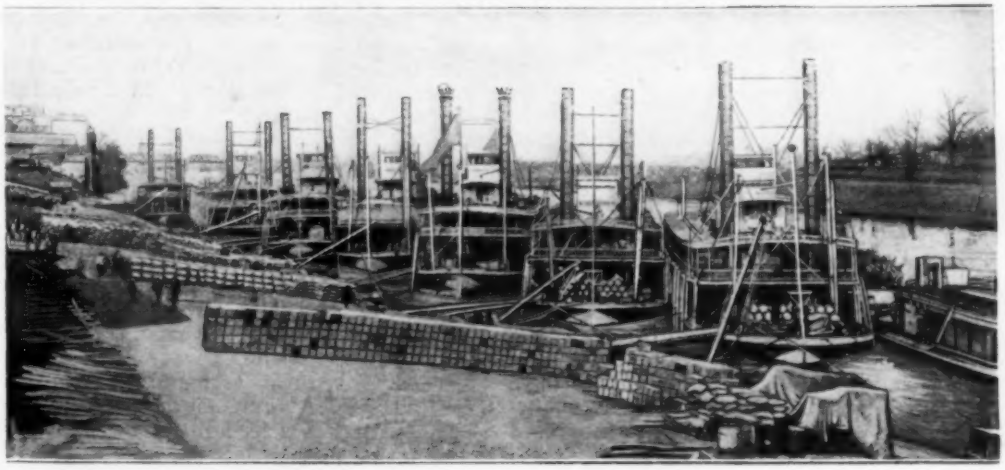
A soft-face flogging hammer that has a mold in connection with it, so that it can be readily refaced, is now on the market. On its hickory handle the hammer has an iron head, strengthened to stand hard usage, on each end of which is molded a special antimony-lead face, the whole being well balanced and of ample weight. The iron mold that goes with the hammer is so shaped that it will slip over either of the soft ends, and form a mold for pouring molten lead so as to form a new face. It is stated that this can be done in three minutes.





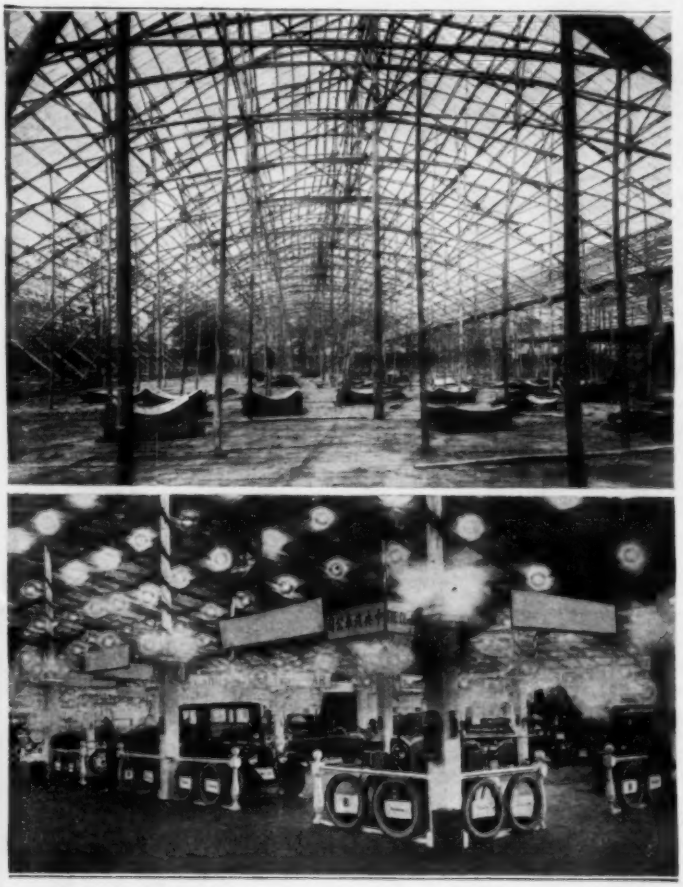
MUNICIPAL RIVER TERMINALS ERECTED AT NASHVILLE

CONSTRUCTION work on the Nashville, Tenn., river terminals, which has been in progress at the municipal wharf since last June, is now nearing completion. Three of the four floors are practically finished, and small quantities of freight have already been stored on them. The terminals are being erected by the city at a cost of nearly $240,000, and will be of great value to the native shippers and receivers, as well as to the railroads and steamboat companies. Farm products will be the bulk of shipments down the Cumberland River from a hitherto undeveloped part of this state and Kentucky, and transferred through the terminals to the railroads for dispatch to their destinations, or to buyers for local use. Above is seen the municipal terminal during construction, while below is a view of the river terminal in 1862, when steamboats were landing war supplies.



FIRST AUTO SHOW IN CHINA HOUSED IN BAMBOO SHED

Very characteristically, the first auto show in China was housed in a huge shed built entirely of bamboo. Arched bamboo ribs with a very large span were supported at several points by slender bamboo posts. In that respect it was very Chinese, but when completed, with its well-furnished booths filled with American and European cars of the latest models, equipped with conspicuous signs in English, and illuminated with a large number of electric lights, it had very much the appearance of an automobile exposition such as one is accustomed to see in Europe or America.



Top: The Huge Shed during Process of Construction, Showing the Long Bamboo Arches Supported by Slender Uprights of the Same Material. Below: Several of the Exhibition Booths at the Auto Show

¶ Tracks of prehistoric animals have been found recently on rocks in Kentucky, between the Kentucky and Cumberland rivers.

TO WIRE APARTMENT HOUSES FOR RADIOTELEPHONE

As an indication of the growing popularity of the radiotelephone, a real-estate firm of New York announces that it will wire several apartment houses for this service. The builders say that it will be better for them to erect one aerial for the use of all tenants than to have the tenants erect individual aerials. A building contractor of Philadelphia also announces that buildings being erected by him are to be wired for radiotelephone service as part of the regular equipment.

EMPLOY OLD RAGS IN NEW PREPARED ROOFING

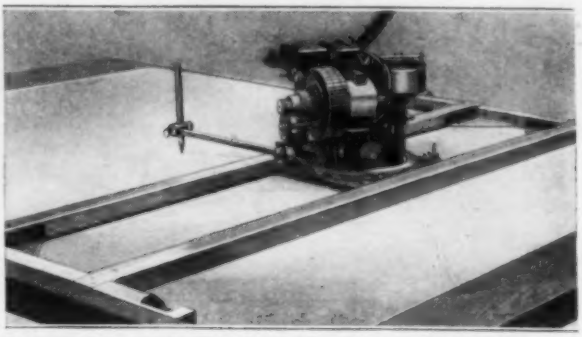
That a waste material may become one of the necessary ingredients of a great industry is shown in the manufacture of prepared roofings, as old rags form the basis of the finished roll or shingle. The rags are collected by dealers and shipped to the factory, where they are sorted and reduced to a pulp which is made into a fabric or felt. Hot asphalt is then forced through all the pores of the fabric, and a coating of asphalt is applied on both sides. The wearing surface is then coated with crushed slate, or other stone, which is pressed firmly into the asphalt coating.

OILED WRAPPERS FOR APPLES STOP FORMATION OF SCALD

Scald, which is a transportation and storage disease of apples, is caused by gases given off by the apples themselves, but can be prevented by the use of oiled-paper wrappers. Tests have shown that the wrappers should carry 15 to 20 per cent of oil in order to be effective in preventing the development of scald. These oiled wrappers are not to be confused with wax-paper wrappers.

INSTRUMENT DRAWS ON CHART COURSE OF SHIP'S VOYAGE

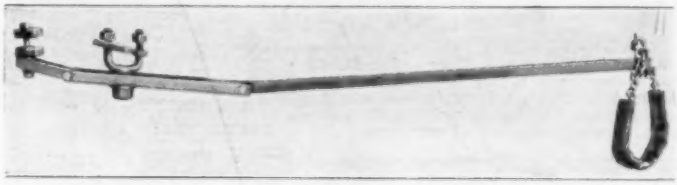
For many years there have been in use odometers, or instruments for measuring the distance traveled by vehicles, and now there has been invented in England an odograph, or instrument for drawing to scale on a chart the course traveled by a ship. The instrument consists of a carriage on casters which has a magnetized propelling wheel supported centrally in a revolving frame carrying an index or pointer in the plane of the wheel corresponding to the ship's head. This is first set by hand on the chart to agree with the true course obtained by the ship's compass. After that it always follows any change in direction of the ship's head, and records it on the chart by means of a pencil in a carrier attached to either side of the carriage. The forward motion of the carriage is at a speed in proportion to the speed of the vessel. The carriage is connected to two rails which extend across the chart to other rails at right angles to them, one on either side of the table that supports the chart.



Instrument That Automatically Draws on a Chart the Course Traversed by a Ship at Sea: Everything is Timed and Adjusted So That the Pencil Draws the Vessel's Course Exactly to Scale

AUTOMOBILE TOWING TONGUE STEERS AUTOMATICALLY

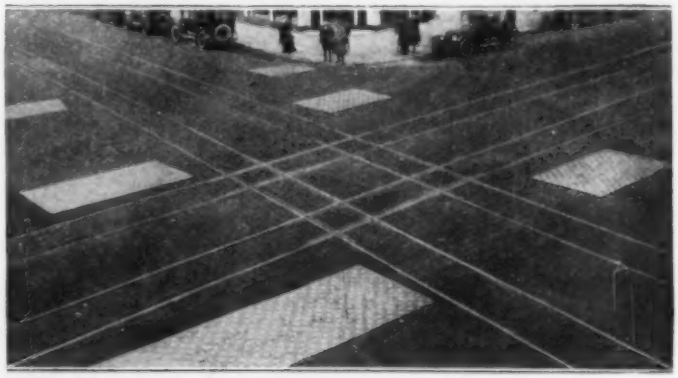
Disabled automobiles, limited in number only by the engine power of the "wrecking car," may be towed by one driver if a recently invented towing tongue is employed. With these tongues, each machine is controlled by the preceding car, and each will follow the same track on curves of any reasonable degree. As the arrangement consists of jointed flat bar steel, there is no unnecessary jerking when starting or stopping, and no resultant broken fenders, headlights, or other damage from rear-end collisions.



Automobile Towing Tongue Which Automatically Steers as Many Disabled Machines as the Wrecking Car can Pull Back to the Garage

ADVERTISING STUNT TESTS FLOOR COVERING

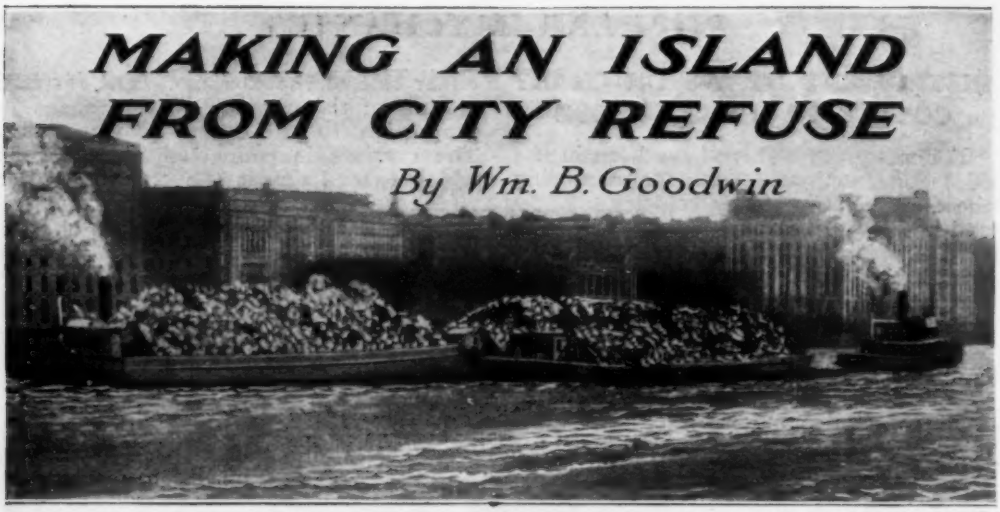
Not content with subjecting his floor covering to foot traffic by placing a strip of it on the sidewalk, an enterprising merchant placed strips of the same covering in the street, where it was exposed to heavy automobile and wagon traffic. Careful count was kept of the number of vehicles passing over the strips. This, in one case, amounted to 17,000, but the strip showed little evidence of wear.



In Order to Show Its Wearing Qualities, Six Pieces of Floor Covering were Placed in the Path of Traffic at the Intersection of Two Busy Streets

MAKING AN ISLAND FROM CITY REFUSE

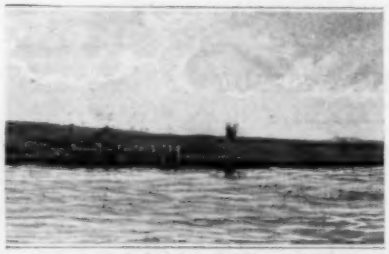
By Wm. B. Goodwin



Scows, Loaded with New York City Refuse, being Towed up the East River to Riker's Island, Where the Refuse is Dumped in Very Large Quantities: This Island is being Made Ten Times Its Original Size

PROBABLY the most complex and unusual formation which is used for raising crops and for other purposes, is situated in the East River, New York, and known as Riker's Island, or Municipal Farm.

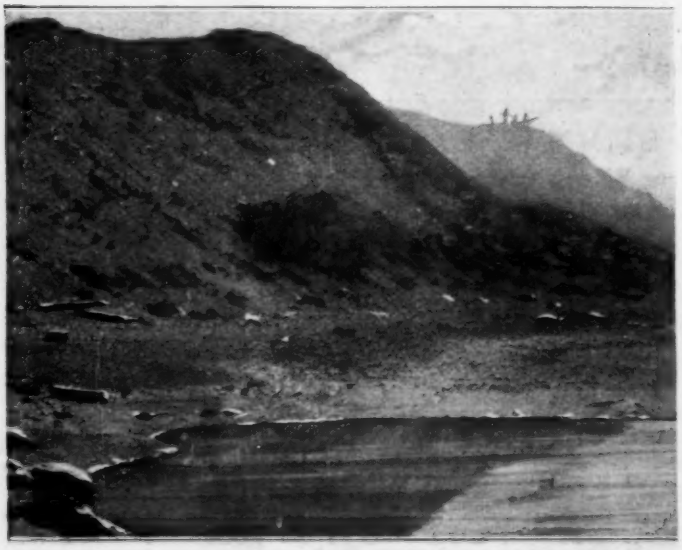
In looking about for a place to dispose of the vast accumulation of waste materials discarded by the thousands of households, the street-cleaning department of New York City decided that if refuse were placed on this island in sufficient quantities, it would provide a place on which to erect buildings and for raising crops.



Looking East from the River at the Municipal Farm Tower Which is Occupied by an Officer Who Reports Irregularities, and Arrests Anyone Attempting to Bring Narcotics to the Occupants of the Farm

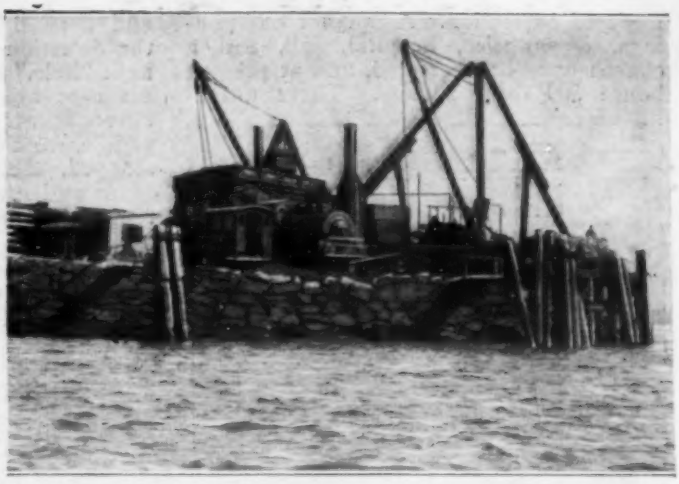
In 1895, the first household refuse was deposited there. Since that time more than 22,500,000 cu. yd. have been added to that plot of ground, which originally consisted of only 60 acres and will eventually be extended to some 600 acres. The material dumped consists of ashes, glass bottles, tin cans, dishes of various sorts, earthenware, beds, mattresses, baby carriages, iron wire, waste paper, wooden boxes — in fact, all household refuse except garbage, which is taken elsewhere.

This refuse is collected from the streets in horse-drawn carts and auto trucks, taken to various docks, dumped directly onto scows, which are towed up the East River to the Municipal Farm and unloaded at two points on the island. It is taken from the scows with steam-operated cranes with dump buckets and placed upon small cars which are easily unloaded by tipping sideways, allowing the con-

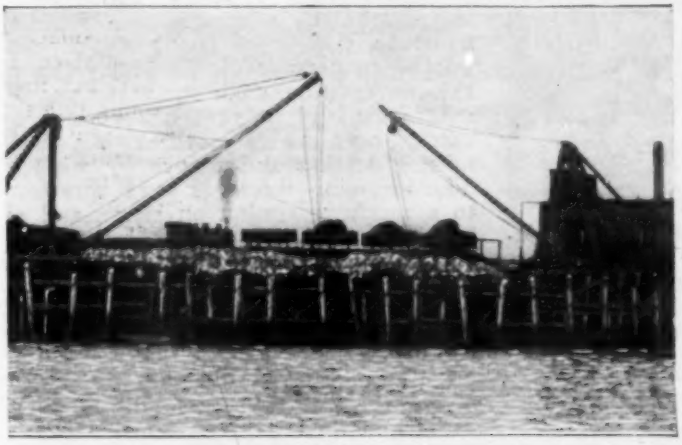


Part of Riker's Island, Showing High Hills Formed by Dumping New York City Refuse There, and Clouds of Smoke from Ever-Present Fires

tents to slide off quickly. Thus hand labor is practically eliminated. The distribution of the refuse over the island is done by contractors under the supervision of the street-cleaning department. From this mass of material, things of value, such as money and jewelry, are sometimes picked up by workmen. Thirty per cent of the city's refuse is disposed of here, the remainder going to other places. The top surface of the island is covered with ashes and makes a



Landing Place and Equipment: Watchman at Right of Derrick Reports Presence of Anyone Attempting to Land on Island from Boats



Loaded Cars Leaving Dock: About 50 Such Cars Are in Constant Use for Hauling the Refuse from the Landing Dock to Various Parts of the Island

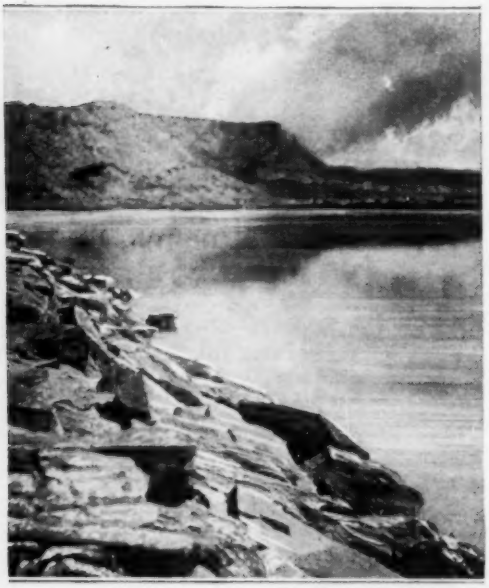
soil which, in a fairly wet season, produces various vegetables, corn, and other crops. Hogs are also raised on the island, and plans are under way for increasing their number from year to year.

One hundred acres are now under cultivation. In places, the mass of refuse is 60 ft. high and forms an uneven surface, elevations and valleys having been purposely created. Soon after the first load of refuse was placed there, smoke and flames began to appear and have not subsided. The smoke is carried long distances by the wind, accompanied with a disagreeable odor. No fires are set, but spontaneous combustion causes the flames to burst forth along the embankments where the filling-in work is done.

The Municipal Farm, or older part of the island, is under the supervision of the city's depart-

Embankment of Refuse Used in Building Up Riker's Island: Space to the Left will be Filled to the Level of the Hills Shown on Opposite Page

ment of correction. A number of buildings, dormitories, hospital, jail, and a church have been erected, and at present house 500 drug addicts. These unfortunates come from the city of New York. After recovery, they are kept working on the farm until the end of their period of commitment.



In Foreground, Part of One Embankment; in Background Another: Space between Them will be Filled

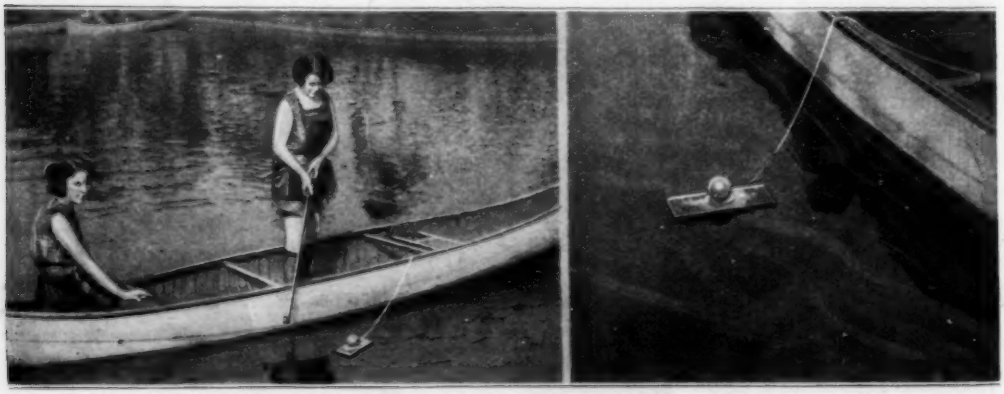
WATER GOLF IS LATEST FAD OF PLEASURE SEEKERS

Water golf, the latest fad of pleasure seekers, is played entirely on the water with the aid of a canoe and a floating tee. The tee, which is tied to the canoe, is placed in the water, the ball upon it, and then driven over the "fairway" in the direction (if one is fortunate) of the next "hole." The holes consist of markers that are anchored at specified distances apart. After the drive, the caddy paddles to the point where the ball has stopped, the player puts it on the tee again and makes another drive, and thus the game continues. Retaining one's balance in the canoe while driving is an extremely difficult feat, the frequent capsizing of these furnishing an amusing feature of the sport.

COMMUNICATION WITH LINER FROM TELEPHONE BOOTH

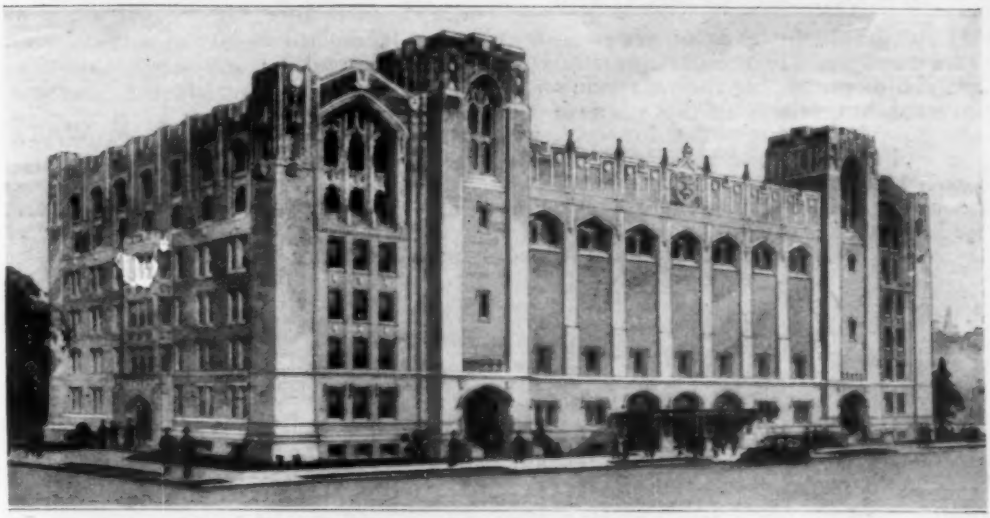
Long-distance wireless telephone equipment recently installed on the U. S. Shipping Board liner "America," furnished the means whereby newspapermen were enabled to talk from common telephone booths, to persons on the ship. During the conversation, while the vessel was 370 miles from land, the reporters' voices were carried over the usual wires to a transmitting station and thence by wireless. The incoming messages were wirelessed to a receiving station on shore, and relayed to the New York telephone exchange by ordinary methods. The feat served as a demonstration of long-distance equipment, which, it is predicted, will soon be in general use on ocean liners.

¶An attempt is being made to raise reindeer in the United States on a commercial scale, and a herd of 50 females and 10 males has just arrived from Norway on the way to northern Michigan, as a nucleus for the herd. For many years these animals have been raised in Alaska, but this is the first attempt to acclimate them in any of the states.



Left: Playing Water Golf. The Ball is Shown on the Floating Tee. The Player Is Ready to Make a Drive, with the Caddy Anxiously Awaiting Results, Which Not Infrequently Means being Tipped Out of the Canoe. Right: Illustrating How the Floating Tee is Tied to the Canoe

BEAUTIFUL FRATERNAL BUILDING FOR FORT WAYNE



BY combining resources, the fraternal orders of Fort Wayne, Ind., are to erect what will be one of the most costly Masonic homes in America. The building will occupy half of a city block, and will be in fact two buildings joined by a large auditorium for the common use of all Masonic orders housed in the building. The auditorium will have a seating capacity of 4,100 persons, making it one of the largest convention halls in the state.

AUTOMATIC FOUNTAIN SERVES SELF-MIXED DRINKS

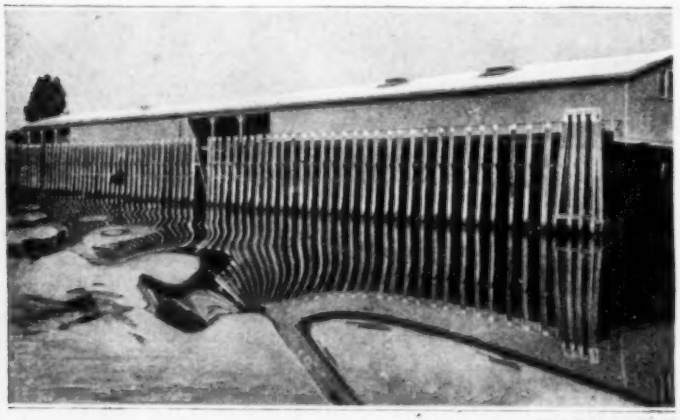
Similar in character to the automatic cafeteria where food is dispensed in return for a coin dropped in a slot, is a new automatic sanitary fountain that dispenses drinks in the same way. But it also does a great deal more than that, for it mixes its own drinks, measures them, cools them, and delivers a paper cup with each drink by means of a cup-dispensing system that is said to be entirely novel in design. The fountain has its own electrically operated refrigerating apparatus, and also a filter which purifies the water before it is used in mixing the drinks. It serves three customers at a time, measures and mixes each drink in 12 seconds, and has a capacity of 500 drinks per hour by actual test. All the sirup tanks are porcelain-lined, and the entire dispensing mechanism is silver-plated.

Automatic, Sanitary, Nickel-in-the-Slot Fountain That Mixes Cold Drinks and Serves Them to Three Customers at a Time: Its Own Refrigerating Apparatus can be Seen Below

¶ That the ancient Inca Indians had a knowledge of brass is shown by the analysis of an ax head composed of a mixture of copper and zinc.

PHOTOGRAPHER IN BOAT SNAPS DISTORTED REFLECTIONS

Photographic studies of water images have been made in the past, usually with the aim of portraying the reflection as an inverted but faithful duplication of the object. The very opposite, however, was the end of experiments carried out recently by one photographer. In every case he attempted to catch the reflection at its instant of greatest distortion. This he did by standing in the stern of a boat which he allowed to drift parallel with and close to the shore. Pointing his camera at the diverging ripples of the wake he secured pictures of undulating docks, oscillating factory chimneys, and other irregularities often seen but seldom recorded for their own sake.



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Photograph Taken from a Boat When the Water was Disturbed by Ripples: If the Upper Half of the Picture were Covered, It would Be Difficult for a Person to Guess What It Showed

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The Reflection of the Chimney in the Water Makes It Appear as though It were Falling in a Most Peculiar Manner

REMOVE OXYGEN FROM WATER TO PREVENT PIPE RUSTING

In western Australia it is necessary to pump water great distances, and it was found that the formation of rust inside the pipe caused a serious loss in the pumping efficiency. It was suggested that the oxygen dissolved in the water might be the cause of the rapid formation of rust, and the experiment was tried of passing the water through a tower in which a vacuum was maintained. It was found that 90 per cent of the dissolved oxygen could be removed in this manner, and the formation of rust in the pipe was practically stopped, as the remaining oxygen was absorbed in the first 30 miles of pipe. Tests of the water at the end of the pipe showed no oxygen.

EQUIP NEW MAIL TERMINAL TO HANDLE BIG TONNAGE

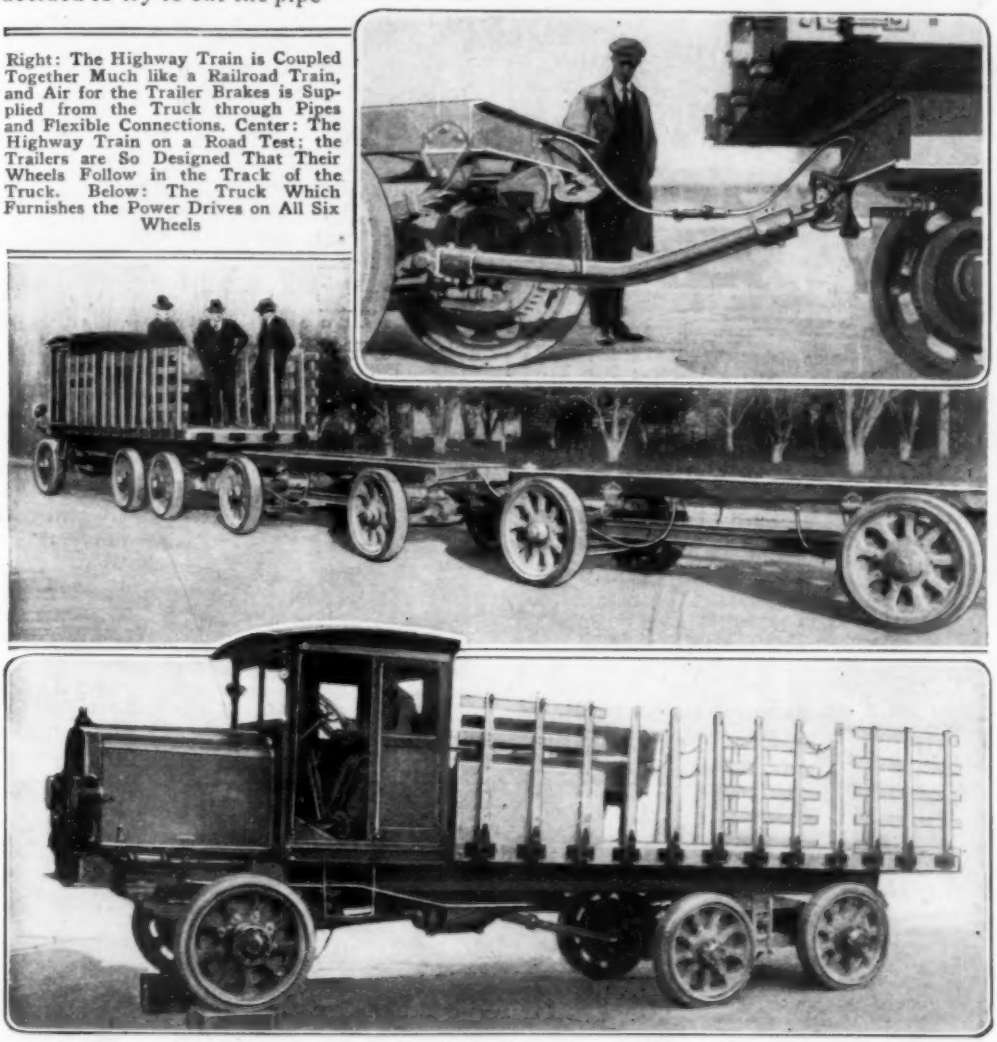
In the construction of the railway-mail terminal at Chicago, much attention has been given the mechanical equipment which will be necessary to transfer and handle the large tonnage of mail matter which will pass through it daily. The terminal will be capable of handling 3,000 tons of mail each 24 hours, and as one part of its equipment, will have 15 freight elevators. The belt-conveyor equipment is one of the features of the installation, as there will be 65 of these, using a total of seven miles of belting of different widths from 30 to 48 in. They will play an important part in the sorting and transfer of mail sacks and packages. The transfer conveyors on the upper floors will be placed near the ceiling and deliver the mail to spiral chutes leading to the delivery belts on the first floor. This method of placing the belts takes advantage of all the space available and leaves the floor clear for the use of trucks.

ELECTRIC TORCH SUCCESSFUL IN UNDERWATER CUTTING

When a 36-in. cast-iron water-supply pipe was broken recently in New York harbor, a difficult task was presented in the removal of the broken piece. It was decided to try to cut the pipe with an electric torch specially designed for underwater cutting. Submarine cutting of steel plates has been done before, but this was the first time that this system was used in cutting cast iron. At the point where the break occurred, the water was 50 ft. deep. Divers were sent down, and the electric torch proved effective, the pipe being cut away in much shorter time than would have been possible with any other known method.

NEW SIX-WHEEL-DRIVE TRUCK PULLS HIGHWAY TRAIN

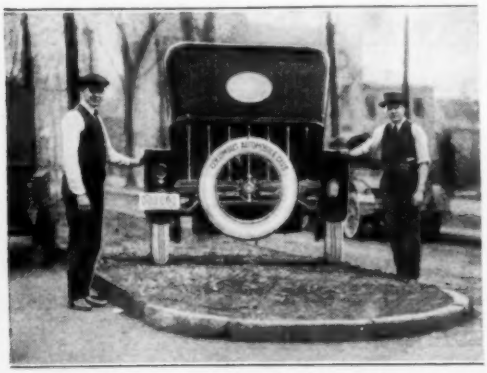
One of the latest developments in highway freight transportation is the six-wheel-drive auto truck capable of carrying a 10-ton load and pulling two five-ton trailers. The truck drives on all six wheels and steers with the two front and two rear wheels. Each wheel of the truck and trailers is equipped with a special hydraulic-pneumatic brake, the brakes on the trailers being arranged to set automatically should the trailer break loose from the train. The trailers are designed so that their wheels will follow in the track of the truck, and are equipped with special antiwabbling devices.



Right: The Highway Train is Coupled Together Much like a Railroad Train, and Air for the Trailer Brakes is Supplied from the Truck through Pipes and Flexible Connections. Center: The Highway Train on a Road Test; the Trailers are So Designed That Their Wheels Follow in the Track of the Truck. Below: The Truck Which Furnishes the Power Drives on All Six Wheels

DANGER SIGN AT BAD CORNER SIMULATES REAL AUTO

Wishing to call the attention of motorists to the curbing at a dangerous street corner, the Columbus, Ohio, Automobile



What Looks like an Automobile Which has Run Up on the Curb Is in Reality a Warning Sign Erected as a Danger Signal for Motorists Turning the Corner

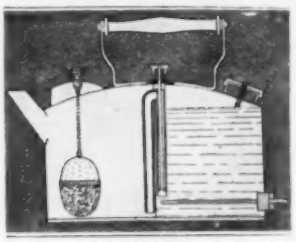
Club erected a warning sign which was formed like the rear of an automobile. A reflecting danger signal was placed in the center of the "spare wheel," which made the sign efficient at night and much more noticeable than the ordinary warning sign.

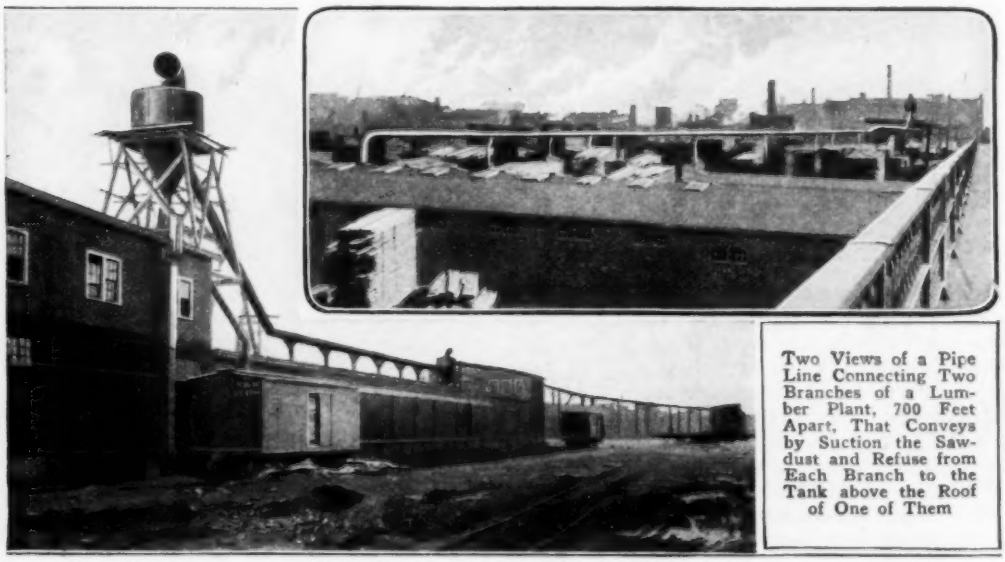
REFUSE CONVEYED BY SUCTION IN 700-FOOT PIPE LINE

When recently a lumber company in Ohio built an addition to its plant, situated at a distance of 700 ft., there arose the problem of how to handle the sawdust and refuse of both plants efficiently as a unit. The difficulty was overcome by connecting the two plants with a 15-in. pipe line. In connection with this is an air pump which conveys by suction the sawdust and refuse from each plant along the pipe line to a spout that is about 25 ft. above the roof of one of the plants. At this point there is erected on the roof a tank into which, in this way, the refuse is discharged. The tank has a hopper bottom with a discharge pipe leading from it to a point just above a side track for box cars. By this means it is loaded into the cars for shipment. The lumber company thus avoided a threatened increase in its insurance rate of from 20 to 25 per cent, and at the same time does the work more efficiently.

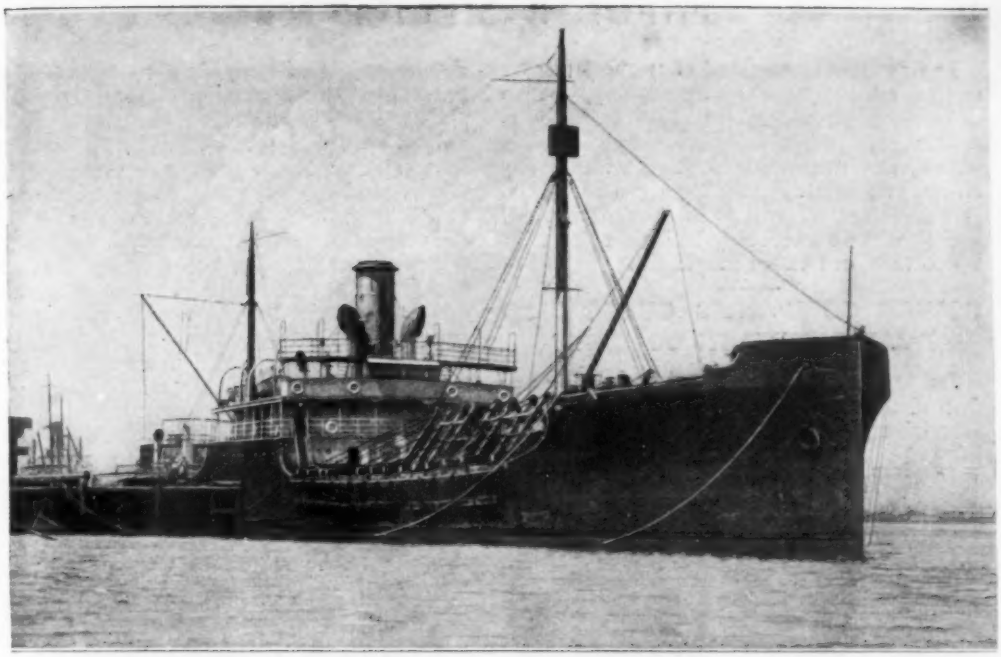
NEW ELECTRIC TEAKETTLE HAS TWO COMPARTMENTS

An electric teakettle has lately been devised which is divided into two compartments. In one compartment an electric element heats the water until it boils; then, by pressing a button at the center of the top, a valve is opened and the steam pressure is made to force the boiling water into the compartment where the tea ball is hung.





Two Views of a Pipe Line Connecting Two Branches of a Lumber Plant, 700 Feet Apart, That Conveys by Suction the Sawdust and Refuse from Each Branch to the Tank above the Roof of One of Them



The Wrecked Concrete Tanker "Selma" Tied Up at a Galveston Wharf, after having been Raised by Means of Compressed Air: The Bracing of the Forward Deck Was to Strengthen It So as to Resist the Air Pressure. The Vessel Sank upon the Mud beside the Wharf, and Remained There Nearly a Year

CONCRETE SHIP BURIED TO SAVE EXPENSE

THE use of reinforced concrete as material for building ships was dealt a severe blow recently when the Shipping Board towed the concrete tanker "Selma" from the wharves at Galveston, and literally buried it at considerable expense, to get rid of it and stop wharfage charges.

The vessel, which is reported to have cost nearly $2,000,000, ran into the rock jetties at Tampico, Mexico, about a year ago, and ripped a big hole in the bottom of the hull. The tanker was raised with compressed air and towed to Galveston. There, shipbuilders decided that it would not be practicable to repair the damage. The rods which reinforced the concrete were projecting through the hull, and it would have been difficult to get the craft in position upon the drydock for repair. So the "Selma" was allowed to sink upon the mud at a wharf where it lay for nearly a year, and wharfage charges of about $1,500 a month piled up.

The task of getting rid of a steamship, especially one with a big hole in its hull and ready to sink in the nearest deep water, seems simple at first sight. However, the Shipping Board had considerable difficulty in disposing of the "Selma." It was first offered for sale, and nobody wanted it. Then it was proposed that it be towed out and beached near the Galveston jetties, for use as a fishing pier. The Federal engineering department objected on the ground that the hulk might set in motion currents which would undermine the jetties. The proposal of taking the ship to sea, and allowing it to sink, was abandoned because it was feared that it would sink before it could be towed far enough not to become a menace to navigation.

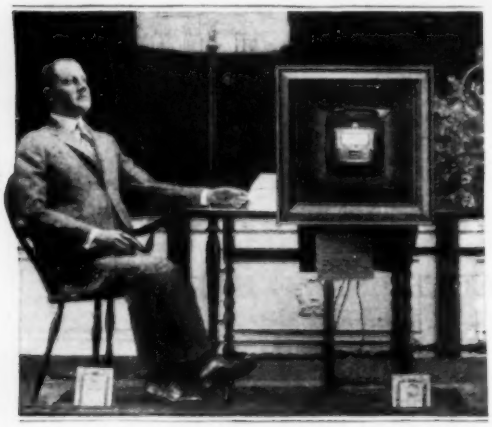
The ship drew about 24 ft. of water when lifted as high as it was possible, and for that reason the only spots along that section of the coast that it could reach were considered to be navigable waters which must not be obstructed. The gulf is so shallow around Galveston that the vessel could not be brought within a mile of the beach.

The problem was solved by dredging a channel from the deep water of the government channel into Galveston and out into the sand flats at one side of it. This channel was cut 30 ft. deep for 400 ft.; the "Selma" was raised by compressed air, run into this channel, and allowed to settle to the bottom. Its decks and upper works are still above water, and are expected to remain there for a long time. But the currents will soon refill the channel, and the tanker will be lying in sand with only a few feet of water around it. If the vessel is ever desired for use again, it will be necessary to dig it out.

It has been suggested that the hulk be used for a shrimp-canning factory, but no definite steps along this line have been taken. All movable machinery was salvaged, but the major portion of the machines on the "Selma" were bedded in the concrete of which it is constructed, and it will be necessary to break the ship up to take out these machines.

POWER COMPANY'S CUSTOMERS READ METER IN CONTEST

During a meter-reading contest conducted for the benefit of its customers, a Harrisburg, Pa., power company discov-



Display Window of Power Company, Showing the Watt-Hour Meter Placed in a Framed and Velvet-Lined Box

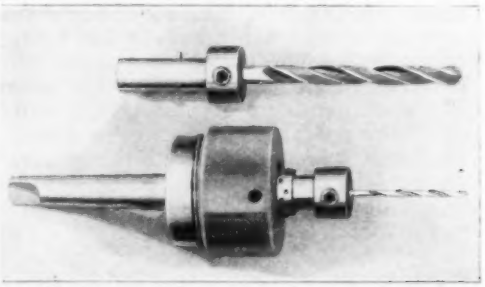
ered an amazing lack of understanding relative to the correct reading of the instrument. The meter was placed in a display window of the concern, and cards furnished to those desiring to enter daily records of their conception of the amounts shown on the dials. These cards, together with similar ones marked by regular meter readers employed by the firm, were handed in to clerks who checked and filed them. At the conclusion of the 12-day period, when the several prizes for the best average cards were to be distributed, it was found that but one of the many participants possessed a perfect score.

USE OF SECONDARY CONDENSER IMPROVES AUTO IGNITION

New principles of condenser construction in connection with a high-tension magneto-ignition system for auto engines have been discovered by an experienced engine builder of Detroit. This new condenser, made of glass, is absolutely sealed from brush-discharge loss, and is practically indestructible, for it takes 60,000 volts to puncture it. Another departure from the common practice in condenser construction is the use of very thin steel plates in connection with the glass-tube dielectric. After the steel plates are electrically connected, the glass tube is incased in a mahogany box, and the condenser is sealed by pouring over it a cement that has been made specially for this work. It is poured in at a temperature of 250°F., which removes all traces of moisture in the condenser, and eliminates brush-discharge losses. It is used as a high-tension secondary condenser in the high-tension circuit of the ignition system.

SAFETY DRILL AND TAP CHUCK SAVES TOOLS FROM DAMAGE

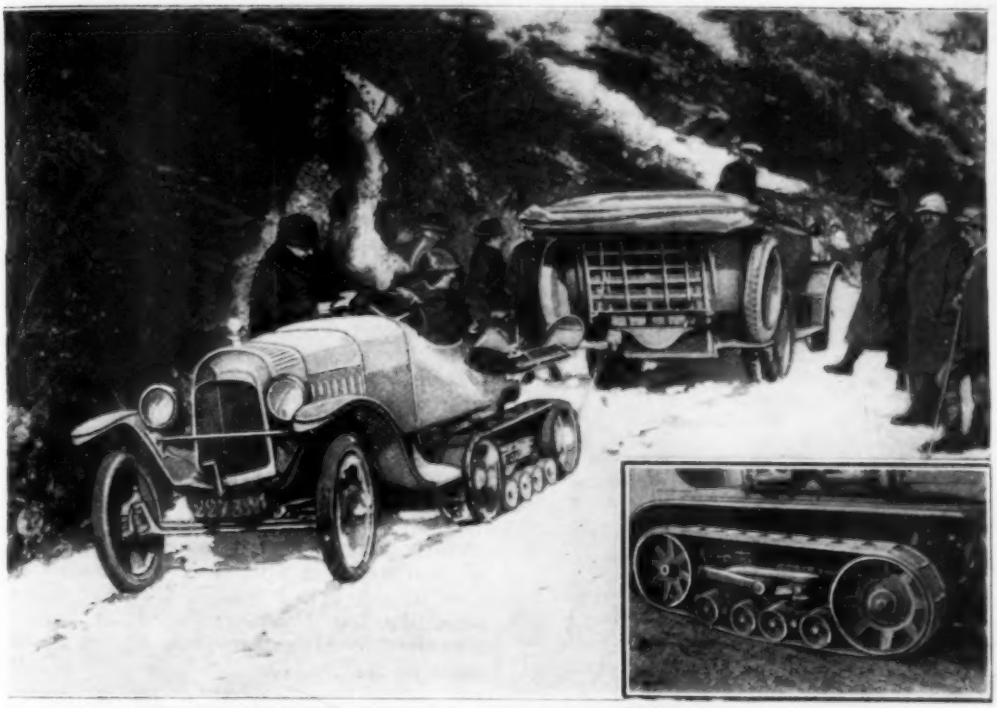
A friction-drive positive-safety drill and tap chuck, recently patented, has a soft-steel pin which drives the collet, in which the drill or tool is held, and shears off when the cutting tool is overloaded. The collet slips into the chuck when the sleeve is raised, and is held rigid when the sleeve is lowered. In the small end of the collet is an ejector. A light blow on this releases the drill or tool. A hollow screw in the collet prevents the tool from being pulled out or pushed in, and end play of the collet is impossible. As a result of this construction it is impossible to break or burn drills or other tools held



Friction-Drive Positive-Safety Drill and Tap Chuck Are Below. Above, the Collet is Removed, Showing the Soft-Steel Safety Pin That Drives It

in the collet. The tools can be made of carbon steel, and the cost of high-speed steel is, therefore, avoided.

¶Recent radiotelephone broadcasting by the New York Western Electric Station, using a limited wave length, was heard by a vessel 1,000 miles west of San Francisco.



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AUTOMOBILE FITTED WITH TRACTOR TREAD FOR TRAVEL OVER SNOW

TRIALS of devices to fit automobiles for travel over snow-covered roads were recently held in France. One of the competitors fitted a tractor tread to his car, consisting of two wheels over which a rubber belt traveled. Four small intermediate wheels helped support the weight of the car and give the belt traction on the snow.

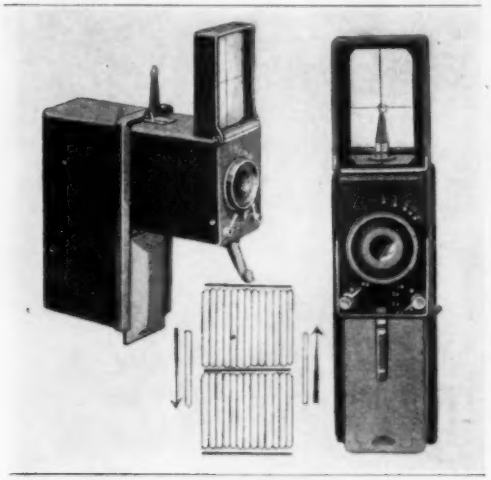
WAR DEPARTMENT SUPPLIES BEDS TO FOREST SERVICE

One of the valuable pieces of work being done by the salvage office of the War Department is providing a supply of beds for the warmth and comfort of forest rangers and volunteers during rests in fighting forest fires. These emergencies require the services of every available man in the region for a task which is extremely taxing. It is essential that during the short periods of rest which are possible, each should have an opportunity to sleep in warmth and comfort. Bed rolls, containing three woolen army blankets and two shelter halves, are now supplied to the fire fighters. The shelter halves form a regular army shelter tent. The blankets are washed and disinfected at frequent intervals. One bed is apportioned to two men in the summer, while in cold weather each ranger is supplied with a separate unit, and they are carried from one locality to another on mules.

A Pile of Bed Rolls at the Denver, Colorado, Headquarters of the Forest Service, Where 500 Units are being Put in Readiness for Distribution to Camps in the National Forests of Colorado, Wyoming, and South Dakota

TINY FRENCH PLATE CAMERA IS BUILT LIKE A PISTOL

A small camera, which might almost be called a watch-charm design, has been introduced by a French firm. In general

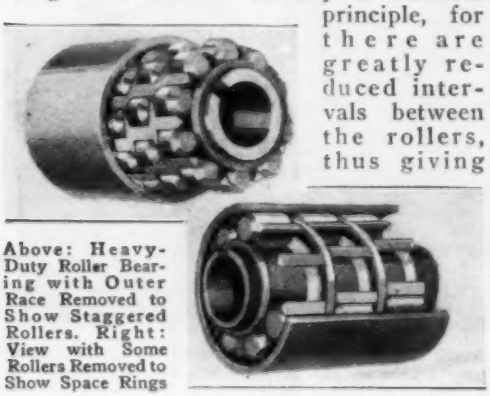


This Extra-Small Plate Camera is Sighted and Snapped like a Pistol. The Diagram Shows the Method of Shifting Exposed Plates in Holder Magazine

appearance it resembles a pistol, and it is pointed and snapped in a similar manner. It carries 48 plates in two compartments, and has an indicator which tells the number exposed. When closed, the range finder folds over to form a protection for the face of the camera, and the trigger snaps up to hold the finder securely. The pictures taken are about ¾ by 1⅛ inch.

STAGGERED ROLLER BEARINGS FOR HEAVY-DUTY SERVICE

Heavy-duty roller bearings are now being made which embody a valuable principle, for there are greatly reduced intervals between the rollers, thus giving a much more continuous radial bearing. This is accomplished by cutting the rollers in sections, spacing them in series longitudinally, and staggering these series with relation to each other. The rollers are mounted in a cage with suitable clearance, and means for retaining them in their staggered positions. Adjustable space rings are mounted on the inner race so as to take care of all end thrust, and also to prevent friction between the ends of the rollers. In general, the inner and outer races are similar to those of conventional bearings.



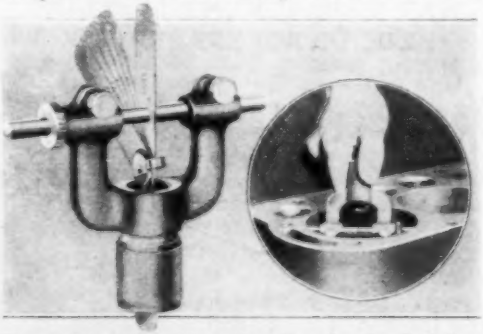
Above: Heavy-Duty Roller Bearing with Outer Race Removed to Show Staggered Rollers. Right: View with Some Rollers Removed to Show Space Rings

BRICK PAVING SERVES WELL DURING LONG PERIOD

The first use of building brick for street paving was in Charleston, W. Va., in 1871, and the pavement gave good service for 38 years. Another brick pavement in the same city has been down for 27 years and is still in good condition. One of the first bricks laid in the older pavement has been preserved; it shows a wear of less than one inch during its 38 years of service.

SIMPLE GAUGE TO MEASURE OVERSIZE IN CYLINDERS

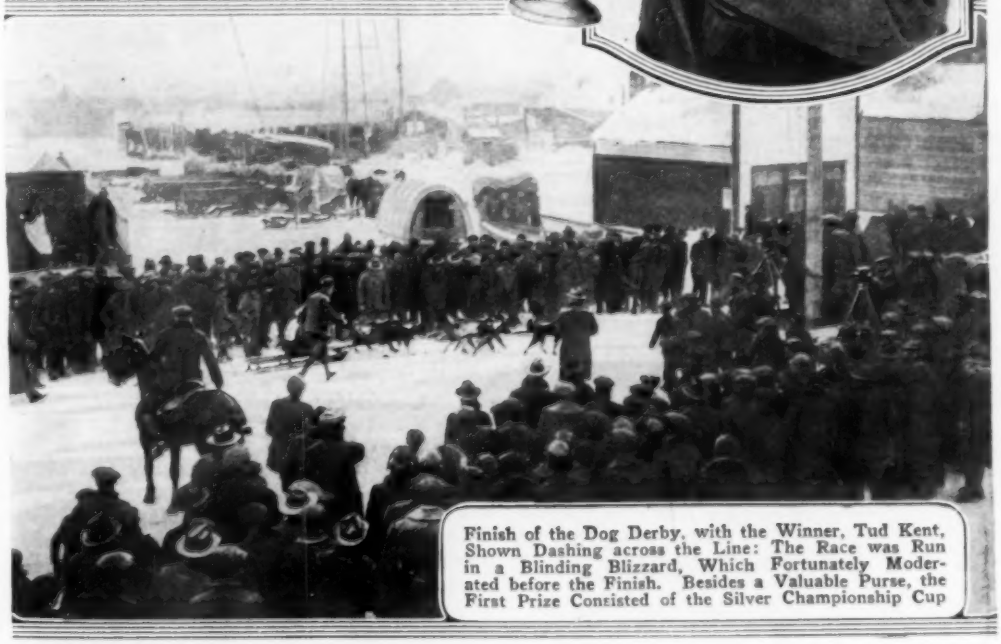
For measuring with precision oversizes in cylinders or pistons, a gauge, much simpler and more easily read than the ordinary micrometer, is now on the market. Its pronged arms carry pins, one fixed and the other adjustable, the combined length of which, when together, equals the nominal diameter of the cylinder to be measured. Therefore, any opening between the two pins shows the oversize of the cylinder. This opening is measured with a thickness gauge, of which several are provided, each stamped with its thickness in thousandths of an inch.



Micro Gauge for Measuring Oversize in Cylinders, Shown with One Blade of a Thickness Gauge between the Pins: Insert Shows the Gauge in Use in a Cylinder

THE GREAT AMERICAN DOG-TEAM DERBY

Start of the Great American Dog Derby, Held at Ashton, Idaho, February 22, as the First Big Event of the Yellowstone Golden-Anniversary Year: Governor Davis, of Idaho, Was the Official Starter. The Dog Team Shown in the Picture was Driven in the Race by the Only Woman Competitor, Miss Lydia Hutchison. She is Standing beside the Sled, and Evidently Matches Up with Any of Her Male Rivals—in Size, Strength, and Nerve, Not to Mention Clothes. On Her Back Are Two Numbers, One for Herself and the Other Representing "Snaky Gaston," the Famous Dog-Team Driver Who was Lost a Day before the Race



Finish of the Dog Derby, with the Winner, Tud Kent, Shown Dashing across the Line: The Race was Run in a Blinding Blizzard, Which Fortunately Moderated before the Finish. Besides a Valuable Purse, the First Prize Consisted of the Silver Championship Cup

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INHABITANTS OF BORNEO EAT FLESH OF CROCODILES

Crocodile meat is considered a delicacy by the natives of Borneo, and when one of the reptiles is slain, there ensues a mad scramble for its flesh, and feasts for those who obtain portions of the careass. The liver has a flavor which makes it especially desirable to the queer people. It usually is allotted to the man who took the most important part in the slaying of the monster.

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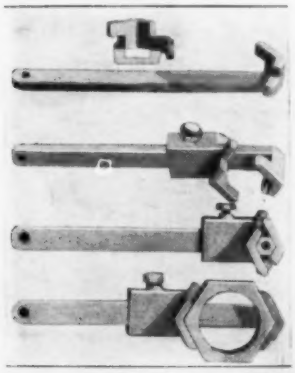
Slain Crocodile Surrounded by Group of Borneo Natives, Who Consider the Flesh of the Monster a Delicacy, and Permit the Executioner to Carve Out the Liver for His Reward

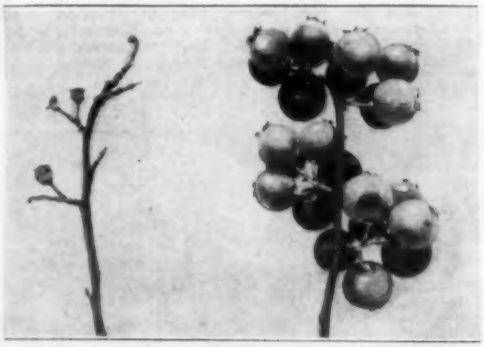
SOCKET WRENCH ADJUSTABLE FOR VARIOUS-SIZED NUTS

Adjustable for use on from ¼ to 4-in. nuts, a newly invented socket wrench consists of a shank with a V-shaped jaw at one end and at right angles to it. On the shank slides a similar V-shaped jaw, with the "V" reversed, that can be held with a setscrew in any adjusted position. Thus the two jaws are made to grasp hexagon nuts of any size, and the tool can be used as a socket wrench wherever there is nothing to interfere with the radial movement of the shank when turning the nut.



BLUEBERRY EXPERIMENTS GIVE REMARKABLE RESULTS

Unlike most plants, blueberries thrive only in acid soil and their propagation offers an opportunity for utilizing land otherwise unfit for agriculture or, at best, requiring expensive treatment. For this reason, the Department of Agriculture has been conducting experiments, for the past 10 years, to develop a superior type of berry for cultivation. Most of the work has been done at Whitesbog, N. J., where the combination of sand and peat soil affords ideal experimental conditions. It has been highly successful and hybrids have been developed which are the size of Concord grapes, and in some cases even ¾ to ⅞ in. in diameter, though the wild berries are only about the size of peas. They have also been selected for flavor, juiciness, and firmness. As yet the giant berries have not become available in sufficient quantities for acre planting, though a number of irresponsible dealers have sold plants, by misleading statements, which have proved a disappointment.



Left: Twig of Blueberry Bush with Berries of Ordinary Size. Right: Twig of the Same Bush Whose Flowers were Pollinated from Another Bush

TO STUDY STANDARDIZATION OF BUILDING MATERIAL

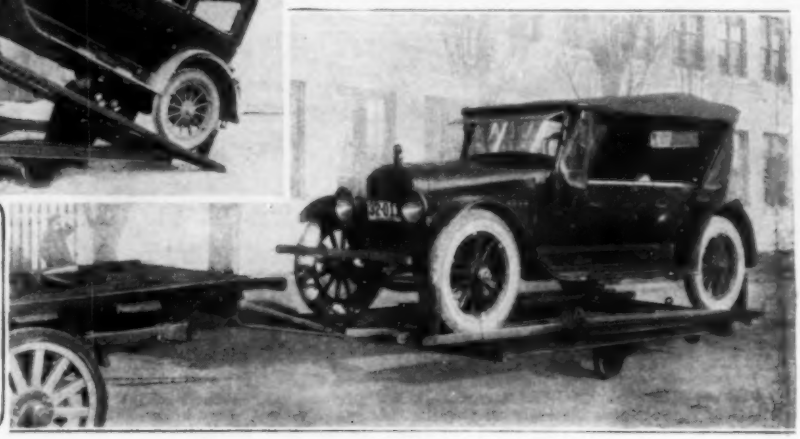
As a means of eliminating waste in industry, it is proposed to study the problem of standardization as applied to building materials, with a view of simplifying the types and reducing the number of different sizes of various materials. Items mentioned for study include millwork, plumbing, heating, hardware, and clay products.

RECORD VIOLENT EARTHQUAKE UNDER PACIFIC OCEAN

On January 31, the seismographs all over the country recorded an unusually violent earthquake which was calculated to be at the bottom of the Pacific Ocean, off the coast of Washington or Oregon. At some of the stations the instruments registered more violent disturbances than at the time of the California earthquake of 1906. The disturbance lasted for a little more than three hours, according to the record. It is worthy of note that the San Andreas fault, along which the 1906 earthquake occurred, disappears in a northwesterly direction in the Pacific.

COMBINED TRAILER AND CRANE HANDLES DISABLED AUTOS

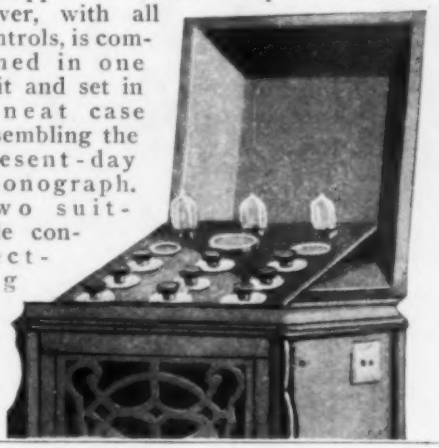
One would hardly expect a practical invention to come from circus clowns, but it is two clowns that have invented a combined auto trailer and crane for handling disabled machines, which promises to prove highly useful. A hinged platform is so mounted on the trailer that a machine may be run onto it. Then, by means of a windlass, the platform is tilted up so that the underside of the car is accessible for repairs. If the car must be taken to a garage, the trailer is hooked to a truck and the whole outfit towed away. A crane attachment, also operated by the windlass crank, can be used to lift the engine out of the machine.



Right: Automobile Trailer being Used to Haul a Disabled Car to the Garage for Extensive Repairs. Above: Elevator or Crane Feature of the Trailer for Making Slight Repairs While on the Road

CONSTRUCT RADIOTELEPHONE IN FORM OF PHONOGRAPH

At last the radio phonograph has made its appearance. A complete radio receiver, with all controls, is combined in one unit and set in a neat case resembling the present-day phonograph. Two suitable connecting posts are provided for connecting to aerial and ground, the only exterior devices necessary for operating. In the lower part of the cabinet is a storage battery which furnishes power for filaments of the audion bulbs. A rectifier and hydrometer test set are also provided for recharging and testing, so that no detail in the care of the battery is left out. Due to the fact that radio music is now broadcast at all times, it is only necessary to connect aerial and ground and then tune in and enjoy a concert.



After Connecting to the Aerial and Ground Wire, the Radio Phonograph is Tuned In by Adjusting the Control Disk

¶ The Bureau of Mines is soon to undertake the study of the problem of the preparation of such alloys as that of 50 per cent copper and 50 per cent lead.

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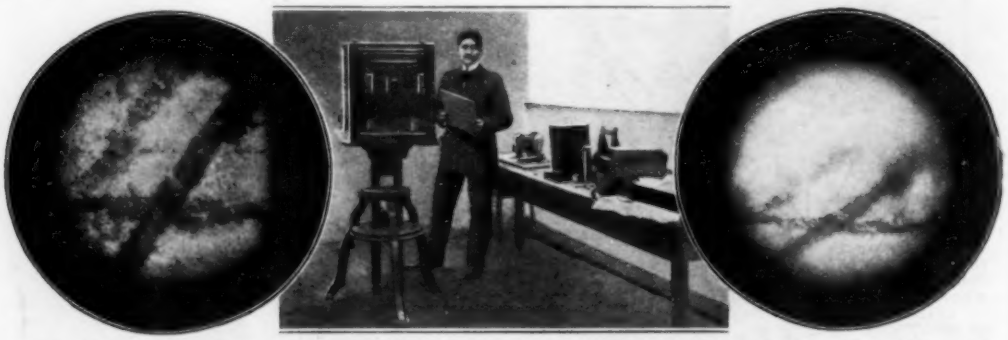
LAST RITES FOR THE VICTIMS OF THE "ROMA" DISASTER

WHEN the airship "Roma" crashed to the ground, 34 persons were carried to their death. Because many of the bodies had been shipped for burial to homes in distant parts of the country, one body was selected to represent all of the victims. Full honors were accorded this body, and all business activity ceased as the funeral cortège moved from the church to the Casino Grounds, at Newport News, Virginia.

DETECTION OF FORGERIES BY MICROPHOTOGRAPHY

With the help of the microscope and microphotography, it has been possible by means of an exact examination of the ink, and otherwise, to distinguish forged writings from the authentic. But in the case of changes of figures or words in old handwriting by superimposing new pen strokes, it has always been difficult to determine which of the pen strokes preceded the other, and thus to decide positively which was the genuine and which was the falsification. In doing this by means of microphotography, it has been customary to place the object photographed at right angles to the camera, with results that are not satisfactory. A Frenchman, very well known for his remarkable work in criminal detection, has proved that if the document be placed so that the writing is viewed horizontally, the results are very much more satisfactory than when the document is held at right angles to the camera. His method shows clearly which of two pen strokes, one above the other, was made last.

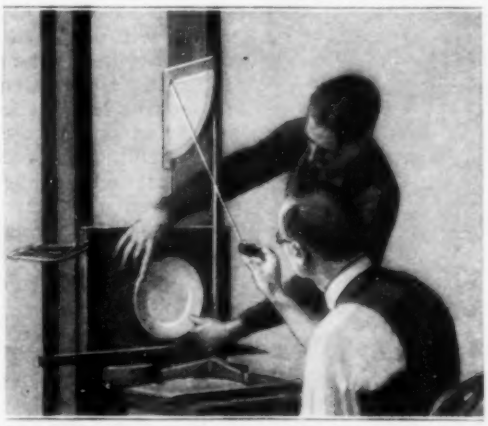


French Microphotographic Apparatus for Detecting Forgeries: At Left is Shown a Photograph, Taken in the Old Way, of a Figure "1" That was Later Changed to a "4," Which Shows the Horizontal Stroke Apparently below, Whereas It Was Actually above, the "1," as Shown Clearly in the Photograph to the Right, Which was Taken by the New Method

STANDARDIZING DISHES TO AVOID BREAKAGE

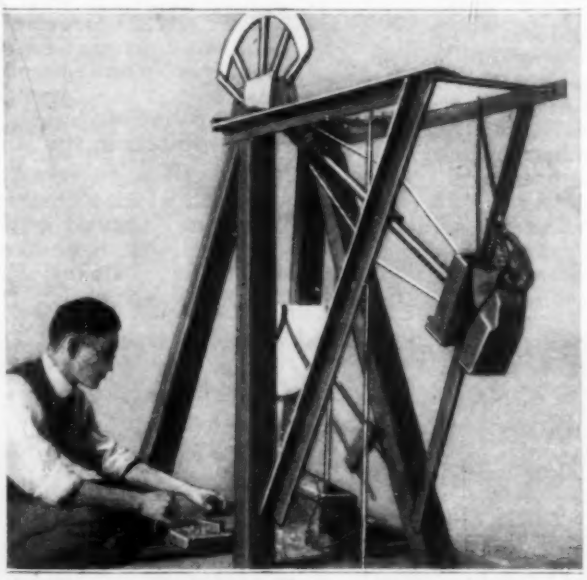
By G. H. DACY

THE dish-juggling and glassware-smashing stunts of "slapstick" comedy are being tried out at the Bureau of Standards laboratories, where dish and glassware-durability tests are now in progress, in order to obtain definite data for the formulation of crockery and glassware specifications which it is expected will be widely adopted. A most novel tumbler tester has been devised which subjects glasses of all classes and types to service wear and rough handling such as they would be exposed to in active use. This glass-tumbler destroyer consists of a holder in which the different glasses are placed with the bottom side exposed. An iron ball is suspended on a metal rod like a pendulum so that it can be withdrawn different distances and then released and allowed to ram into the bottom of the tumblers. All tumblers which will withstand the impact of a full-swing blow are qualified as satisfactory. The force of the blow delivered in this manner is equivalent to dropping the tumblers from an elevation of four feet upon a concrete floor.



Pendulum Hammer Which is Used to Break Plates Whose Durability is Measured by the Length of the Arc through Which the Pendulum Swings

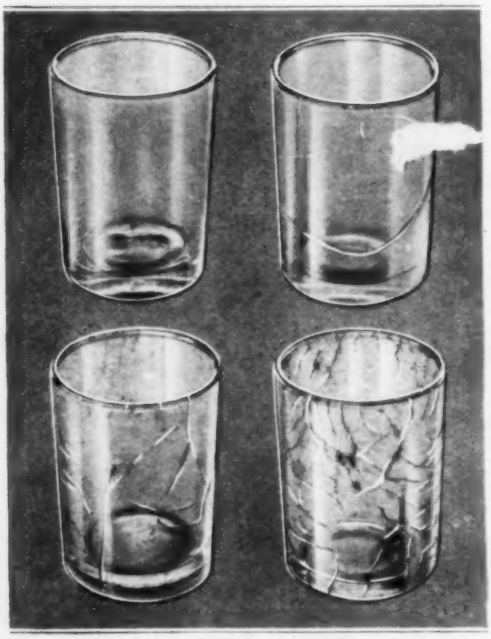
Heretofore, the U. S. Army has been accustomed to purchase hand-made tumblers for use at barracks and messes in all parts of the country. The experts at the Bureau of Standards have ascertained by their extraordinary tests that the machine-made tumblers which cost 50 per cent less, are just as durable and satisfactory for army use as the more costly glasses previously used. As a result of the investigations now under way, new specifications for army glassware are being drawn up. In addition to the direct jarring tests, many other practical and simple methods of exposing glass and dishware to rapid and effective service tests are followed in these investigations. The crockery is exposed to extremes of heat and cold similar to the conditions which obtain where automatic dishwashing machines are used. Study is being made of the cobwebs of cracks which occasionally develop in poorly made chinaware, to ascertain the cause and cure for these defects. Glassware is also subjected to boiling tests in order to determine its suitability to withstand regular and routine sterilization after use.



Pendulum Hammer Used to Determine the Breaking Point of Plate Glass, Which is Placed in the Path of the Hammer Whose Swing is Increased Until the Glass Breaks

In addition, strength tests are being conducted relative to the durability and adaptability of different kinds of plate and window glass to various kinds of service. Approximately 5,000 samples of different kinds of plate glass have broken in various strength tests. As a consequence of these experiments, it is anticipated that shortly the American Institute of Architects will draw up and

follow new specifications for plate and window glass. Detailed tests are also being performed with porcelain and enamel-



Glasses Which have been Subjected to a Boiling Test of Six to Twelve Hours for the Upper Two, and for the Lower Pair, Which Is of Inferior Quality, of Five to Twelve Hours

ware in order to find out the exact serviceability and durability of these household articles. The fact that the annual dish-breakage bill in a leading Chicago hotel amounts to more than $50,000, while other prominent hostelries report that their yearly breakages aggregate about 20 per cent of their total supplies, indicates the importance of studying and standardizing glass and dishware and of making these articles stronger and of better materials, so that they will be able to withstand severe usage longer and more satisfactorily.

Attempts will be made as a result of these investigations to standardize the sizes of plates used and to grade, classify, and mark crockery accurately so that there will be fewer errors made in its manufacture. The Bureau of Standards is urging the potteries and dishware factories to adopt uniform specifications and, as far as possible, to eliminate unpopular styles and sizes of crockery and tumblers. The tests show that American-made dishware and glassware, such as used in the best hotels, are more durable and serviceable than the best of the European dishes. Our hotel china is the best material of its kind on the market.

PACIFIC COAST OF GUATEMALA TO HAVE BANANA INDUSTRY

For the first time bananas are to be grown on the Pacific coast of Guatemala on a commercial scale. An American corporation, licensed to do business in that country, has acquired a plantation 15 miles west of San José de Guatemala, where it is expected soon to have 2,000 acres planted with bananas. Although the banana industry has reached large development on the Caribbean coast, it has hitherto not been attempted on the Pacific coast, because of a lack of rainfall and transportation facilities. The American corporation intends to employ irrigation, and has completed arrangements for the transportation of the fruit to western ports in the United States.

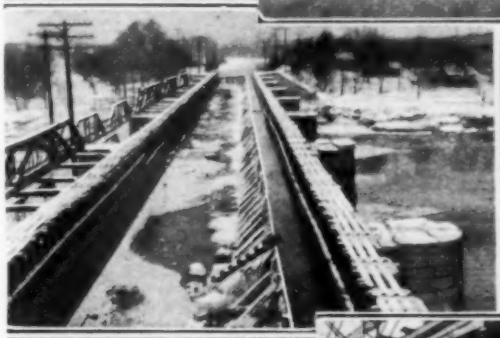
¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

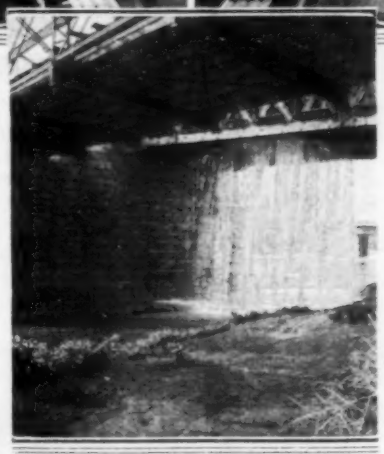
Left: Scale Test for Determining the Durability of Plate Glass. Shot are Loaded into the Pail Until the Glass Breaks under the Weight. Right: Light Pendulum Hammer being Used to Test the Strength and Resistance of Various Kinds of Plate Glass

WOODEN CANAL AQUEDUCT REPLACED WITH STEEL

At the Right can be Seen the Aqueduct over the Fox River as It Appeared during the Winter Months, with Hanging Icicles Caused by the Water Leaking through the Floors. The Bottom Picture Shows the Leaky Condition of the Floor in the Summer, Thus Plainly Indicating That the Old Structure Was in Great Need of Repairs

At the Lower Left is Shown the Aqueduct with a Temporary Flume Built in It for Carrying Water during the Late Winter So That Ice Companies could Obtain Their Annual Harvest. At the Lower Right is Illustrated the Condition of the Old Floor When the Water was Allowed to Run Out So That Repairs could be Made

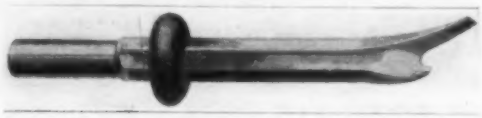




Over the Fox River at Ottawa, Ill., is a large aqueduct which carries the waters of the Hennépin Canal, and which contains eight 57-ft. spans. The original aqueduct was constructed of wood and has had to be repaired very often because of the rapid deterioration of the water-soaked lumber. Last summer the duct was leaking to such an extent that the state proceeded to undertake extensive repairs, but when the water was allowed to run out, the workmen found the entire structure so weak that it was in danger of collapse at any moment. Consequently bids were solicited for the replacing of the old wooden channel with one of steel, which resulted in the acceptance of a bid for the sum of $80,000. The work of dismantling has been started, and the building of the new duct is expected to be completed in a short time. Repairs to several of the lock gates will also be necessary before the canal is again ready for use as a waterway.

RUBBER RETAINER EMPLOYED ON FLUE-BEADING TOOL

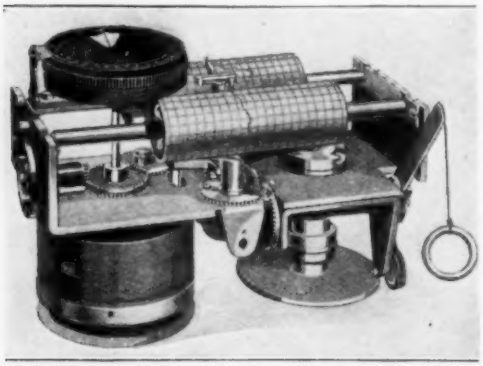
Boiler flues are beaded to insure a tight fit in the fire box, and an Illinois man has produced a rubber retaining ring, to be placed on the tool used in accomplishing this work, which has been found to be a decided improvement. In operation with an air hammer, there is no possibility of the workman accidentally "shooting" the beader, or chisel, far into the flue, if the retainer has been previously fitted on it, and the rubber is an aid in turning the tool when it has become heated.



Flue-Beading Tool, Showing the Rubber Retaining Ring Which Prevents the Tool from Going into the Flue

PRELIMINARY SURVEYS EASY WITH NEW FRENCH DEVICE

An instrument of French design reduces the work of making preliminary surveys quite materially, for it records automatically on two drums the elevation and bearing of the ground covered. In operation, the assistant carries the measuring wire ahead; the surveyor then adjusts the compass to give the direction, and walks toward the assistant. A spring rewinds the wire, and in doing so causes the two drums to revolve, recording the elevations and direction for the distance traveled.



This Portable Instrument for Preliminary Surveys, When Carried by the Surveyor, Records on the Drums the Direction and Elevations of the Course Traveled

LUMBER-TRUCK RATCHET CRANK FACILITATES UNLOADING

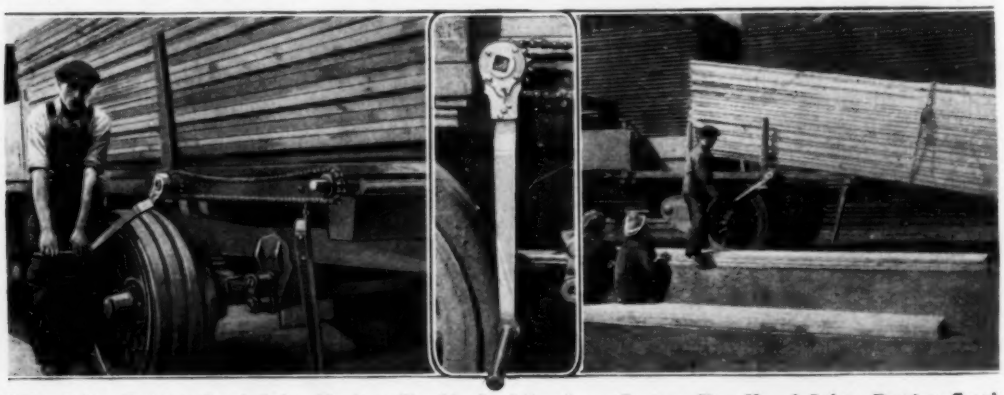
In the ordinary method of loading and unloading lumber by platform rollers on motor trucks, the load is moved backward till it reaches the tipping point, and before the motor truck can be driven forward to draw it from under the load, the crank handle on the roller shaft must be taken off. This is not necessary with a new safety reversible ratchet crank, which can be left on the shaft, and be held in the hand, on account of the action of the ratchet, while the rollers turn rapidly under the falling lumber. This saves time, and prevents any danger of accident from a crank spinning in the air, because of neglect to take it off the shaft at the proper time.

SHOW PROGRESS OF BUILDING WITH GRAPHIC SIGNBOARD

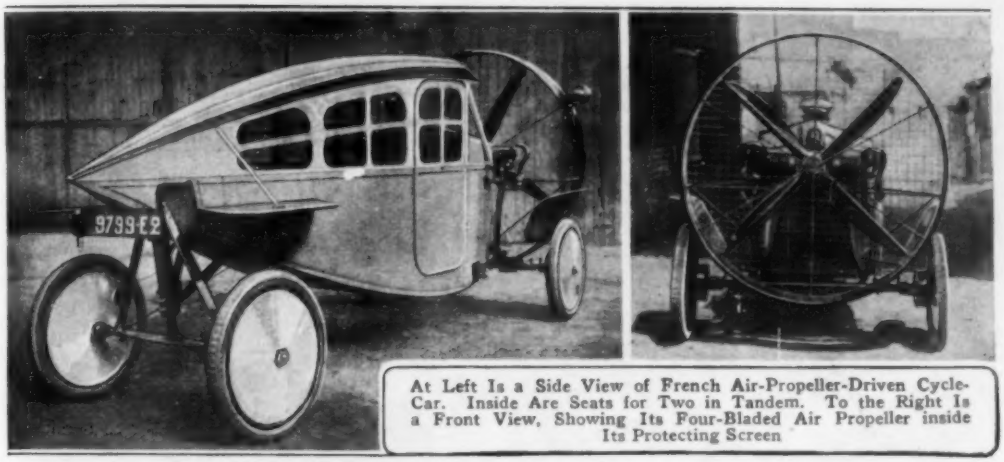
Considerable attention was attracted by a graphic signboard erected on a construction job recently. The board was erected as soon as wrecking operations started on the old building, and as the different operations progressed, the white spaces were gradually filled in with red, showing the stage of completion of the various portions of the work.

The Graphic Signboard Shows That Four Operations are Completed and the "Final Touches" Just Started

¶Blind pedestrians at Denver, Colo., are to be furnished with traffic whistles, by blowing which they may call the traffic officer's attention to their desire of crossing a street.



Left: Safety Ratchet Crank being Used on Truckload of Lumber. Center: Close-Up of Safety Ratchet Crank in Place. Right: Operator Seen Holding the Crank While the Lumber is being Unloaded from the Truck. This is Made Possible by the Use of the Ratchet in Connection with the Crank



At Left Is a Side View of French Air-Propeller-Driven Cycle-Car. Inside Are Seats for Two in Tandem. To the Right Is a Front View, Showing Its Four-Bladed Air Propeller inside Its Protecting Screen

PROPELLER-DRIVEN CYCLECAR BUILT IN AIRPLANE STYLE

A novel cyclecar, designed on the lines of an airplane, including its means of propulsion by a large propeller mounted in front of the car, has recently been built in France. It is a four-wheeled car, with the propeller directly in front of the forward wheels, and inclosed in a light circular frame that carries a wire netting as a protection to the propeller. This is direct-connected to an air-cooled rotary engine of the radial-cylinder type. The propeller is either four or six-bladed, the former where high speed is desired, and the latter where high efficiency is preferable to speed. In the body of the car are two seats in tandem. The car does about 30 miles on a gallon of gasoline, and it has traveled from Paris to Bordeaux, about 360 miles, in one day without any trouble. By substituting pontoons for wheels, the car can be converted into a hydroglider.

VERTICAL SHAPER MODIFIED TO CUT INTERNAL GEARS

Resembling in general appearance and in principle of operation the vertical shaper that was described and illustrated in the November, 1921, issue of Popular Mechanics, is another machine, made by the same manufacturers, that operates with a downstroke instead of with an upstroke like the one described. These two distinct types of the machine have each special advantages for different kinds of work. The downstroke machine is specially adapted for cutting internal gears, internal splines, external cluster gears, and gears in which the teeth terminate near a shoulder. This work could not be done on the upstroke machine, which is specially adapted to cut plain external gears.

COAL WEIGHED AND UNLOADED BY LARGE BRITISH CRANE

A British revolving crane for unloading coal cars not only picks up car and all, but weighs the coal at the same time. The car is carried in a horizontal position to the point where it is to be dumped; one end is then raised until the coal is discharged.

This Revolving Crane Picks Up Loaded Coal Cars and Dumps Them Also, Weighing the Coal as It is Discharged

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CRUDE ALBANIAN BRIDGE BUILT ENTIRELY OF WOOD

THIS wooden bridge spans one of the swift streams of Albania and is built entirely of wood, even to the supporting piers in the stream itself. The bridge is more than 40 ft. high, to allow for the passage of river craft. The rustic effect, due to the timber construction, gives the bridge an appearance very different from the usual steel bridges, yet the structural principles involved are the same.

DURABLE REFUSE CONTAINER MAY BE MADE ORNAMENTAL

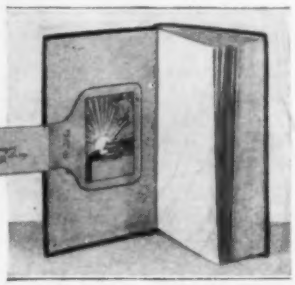
For keeping streets and grounds free from rubbish, without detracting from the general appearance of the surroundings, an ornamental waste-paper and refuse container has been placed on the market. It is a square-shaped steel can with a self-closing cover, through which is dropped a canvas sack which is the container for refuse thrown into the can. On its four sides are spaces for pictorial advertising posters, and above these for street names.

PRODUCE EFFERVESCENT MILK AS CARBONATED BEVERAGE

The fact that pure sweet milk is one of the most wholesome and nourishing beverages has led to many attempts to find a method of preserving it. A patent has recently been granted for a process of preservation by which milk is converted into an effervescent beverage which may be kept for long periods, much as is now kept grape juice or ginger ale. The milk is first agitated under vacuum, at a temperature of from 95° to 101° F., for a few minutes to remove foreign flavors, and is then cooled to 40°, carbonated at high pressure, and bottled. It may then be kept for months under proper conditions of temperature, and when used will be found as fresh and wholesome as when first bottled.

INEXPENSIVE BOOKMARK PASTED INSIDE COVER

"Losing the place" because of not having had a bookmark available to place between the pages, need not perplex the reader henceforth, if he but make use of a simple and inexpensive article of this kind. The marker consists of a piece of paper, which is intended to be permanently pasted on the inside of the cover, and which has a flap long enough to be placed anywhere in the book.

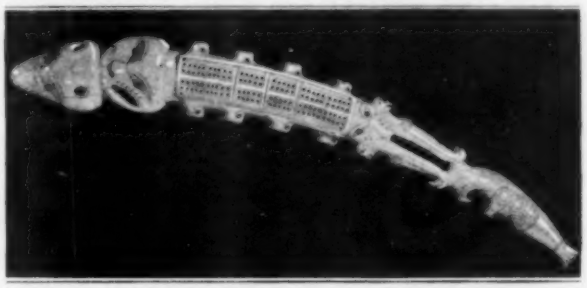


THE IVORY CARVERS OF BERING SEA

By G. DALLAS HANNA

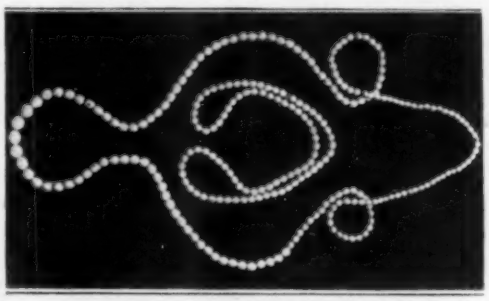
WINTER life in the frozen North is often supposed by those unfamiliar with it to be as dull as a grounded ice floe. It is pretty generally believed that the long nights are spent around a smoky seal-oil lamp with the streams of conversation frozen solid like the tundra. But this is a mistaken notion and far from true.

When the sun sets and does not come back to greet us until late in the forenoon, those are the days when the Northland awakens; then begins the real business of living for the enjoyment of life. Then the sleigh bells jingle in the twilight and the moonlight; the parties, the dances, the hunts, make one continuous season of pleasure from about November until—well, until the outsiders and their ships begin to appear again in the spring. The awful blizzards of which explorers are so wont to tell, really do not enter into the calculations of resident inhabitants to any large extent. They inspire about as much fear in the heart of an Alaskan as the crossing of a street does to the average city dweller.



This Very Ornate Cribbage Board was Carved from a Single Walrus Tusk with the Most Primitive Tools

The summer season is looked upon as a drudgery by most northerners. It is a necessary evil to be endured only because a living must be earned. Most of the annoyances of life come in the summer; the mosquitoes, the gnats, the flies, and the rains and fogs which are immeasurably more disagreeable than the ice and snow.



Strings of Beads, Made from the Smaller Pieces of Walrus Ivory, Are the Most Profitable Product of the Carver, Sometimes Bringing as Much as 50 Dollars

Two to four months' work in the summer season ordinarily suffices to provide the average family with sustenance the entire year. Of course, all work does not cease when the snow begins to fall, but that which follows appeals to the people in a most unmistakable manner. Boats are overhauled and put away for the winter; sleds are repaired and winter gear in general is put in shape for the season.

The native villagers of the North have a peculiar philosophy, and volumes have been written about their manners and customs. I, however, shall endeavor to tell of a particular class of workers who ply their trade almost entirely in winter. These are the ivory carvers, of whom almost every village can boast one or more.

Before the advent of the white man, the northern natives, the Aleuts, and the Innuits or Eskimos, had to depend upon ivory for the manufacture of certain implements essential to their existence. Knives, spears, arrows, needles, axes, harpoons, and many of the ornaments of person or apparel were made of this material. The white man brought tools of iron which, of course, soon displaced the ivory entirely, so far as utility was concerned. But the tools so superior for other purposes were also found to be far superior for the carving of ivory. Files, knives, saws, and lathes from the great and mysterious "outside" were incomparable to the flat stones which had formerly been used.

The natives have found that while the ivory is no longer a necessity to them, it can be made into trinkets and ornaments of various kinds that readily sell to summer visitors at good prices. At King Island, a short distance from Nome, almost the entire male population engages in the trade, and at almost every village up and down the coast the work is carried on to a greater or less extent.

The ivory used in this work comes almost exclusively from the walrus. These

animals are still fairly common in many parts of the North, thanks to the protection which our government has given them. Natives are permitted to kill them for their own use, but the skins cannot be shipped from Alaskan waters. In addition to the tusks of the slain animals, some use is made of those which have been buried in the soil for ages and have become semi-fossilized. These are black or brown with time, and the most highly prized of all ivory. Also, in some places the tusks of the prehistoric mammoth, that long-haired arctic elephant, are used. These tusks are usually called "mastodon ivory" in the North.

A Young Walrus Whose Tusks Are Not Yet Large Enough to Be Valuable: These Animals are Protected by Game Laws, but may be Killed by the Eskimos for Their Own Use

The average walrus tusk weighs about 4 lb., and the usable part is an outside shell from ¼ to ½ in. thick. The center is occupied by "the core," a hard but more or less bony substance of mottled appearance. The ivory portion is much harder than ordinary elephant ivory and takes a much more brilliant polish, but does not possess the well-known "grain" of elephant ivory.

The ivory carver has four stock articles of trade, for which he always finds a ready sale. These are beads, cribbage boards, napkin rings, and crochet needles. Besides these, a long list of sundry objects, suiting the fancy of the individual workman, could be made. Naturally the workmanship cannot compare with that of some of the Chinese whose feats with elephant ivory are almost unbelievable. Still, I have seen some paper knives with lacery work which could hardly be improved. And the making of a chain necklace, with tassels on it, of a single piece of ivory, requires patience and skill and a perfect knowledge of the physical properties of the raw material.

A Native Carver Cutting Beads with a Simple Lathe Which He has Made from Parts Salvaged from an Old Clock

The greatest ingenuity of the native is displayed in the fashioning of his working tools. In one village at the mouth of the Kuskokwim River, the ivory carver's outfit was very simple. He had a sheath knife, an all-purpose implement, which was called into use almost constantly. A saw he had made of a piece of barrel hoop which he had found on the beach. It mattered little to him if it took a day or a week to saw off a tusk. He used a bow drill, just as his fathers had done, and for points he had three nails which he prized very highly. With this outfit he was able to do most beautiful pieces, one of which was a cribbage board.

The devising of a lathe is the most difficult of all feats for the native, and some queer contraptions are doing turning duty. As an example may be mentioned one built by Neon Tetoff, a Pribilof islander, for the making of beads. The essential parts are two brass gears salvaged from an old worn-out Russian belfry clock. The larger one is turned by hand, and to the smaller is attached a shaft with a sort of chuck for holding either the work or the cutting tool.

Ivory beads are about the most profit-

able of all objects for the native, because the market is not flooded; little material is needed, and they are easily sold at 10 cents each or $10 per string. In this work two methods are followed. In one the ivory is turned and the cutting tool is held in the hand. The bead is made and polished while turning, then cut off and drilled. In the other method the ivory tusk is sawed into cross sections, the thickness of the diameter of the bead, and then the holes are drilled. The tool is then revolved while the material is held stationary. For this purpose a hemispherical tool is used, which has a guide to fit the hole in the bead. One side is cut at a time, and then the work is reversed and the bead released. The truing up and polishing is a separate task. Of course, fairly elaborate shop equipment is required for constructing the tools needed in this latter process, and the beads turned out are superior to those produced by the other method.

Of late years I have seen considerable modern equipment assembled by the ivory carvers. Chisels, bracket saws, hacksaws, breast drills, jewelers' files, etc., are quite common, and once in a while a real foot-power lathe is seen. But while the work turned out is eagerly bought by amateurs, it really does not possess the attractiveness of the pieces made with the crude implements of the past.

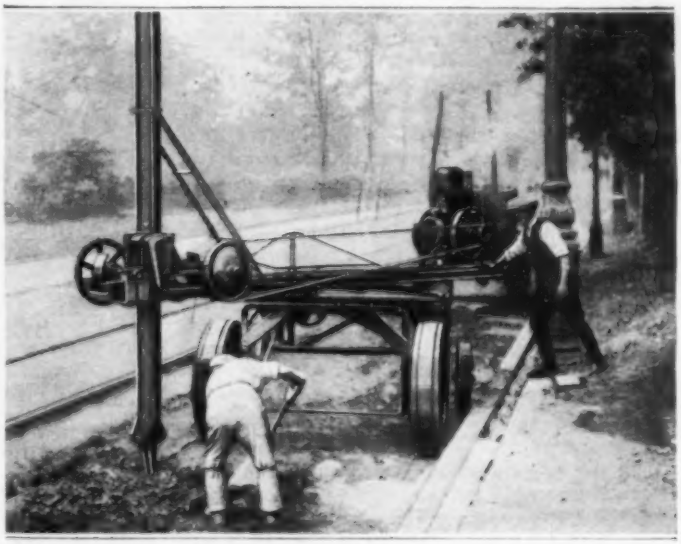
LUNGS AND ARTERIAL BLOOD STUDIED IN THE ANDES

For three months a group of Anglo-American medical investigators studied respiration and blood changes at high altitudes in the Andes, and have now returned to their native countries with some scientific discoveries that may be of value in the treatment of diseases of the heart and lungs. At Cerro de Pasco, Peru, a mining town of 9,000 inhabitants, 14,280 ft. above sea level, a laboratory was established. The subjects for study were divided into three groups—the resident population of engineers who have lived several years at this high altitude, the natives who have been there for generations, and the members of the visiting party. In every case it was found that the arterial blood, instead of being 95 to 100 per cent saturated with oxygen, as it is normally at sea level, was only 80 to 90 per cent saturated at this high altitude. This disproved the theory held by some physiologists that under conditions of oxygen deprivation, the lungs can secrete oxygen to make up for the deficit.

¶The Bureau of Mines is soon to undertake the study of the preparation of phosphor copper by electric smelting direct from phosphate rock.

ROAD-REPAIRING MACHINE RESEMBLES PILE DRIVER

Resembling a small pile driver in action, an English road-working machine consists of a frame on four wheels, that supports a swinging beam which carries the tamping or cutting tool and the driving engine. The beam moves horizontally across the work, and the forward movement is obtained by pulling or pushing the entire vehicle. The tamping weight is 150 lb., and 55 blows with a 24-in. stroke can be delivered in one minute. On surface cutting or tamping, the machine will operate over a width of 8½ ft., and is efficient at a depth of 16 ft. when placed beside a 4-ft. trench, or ditch.



Road-Repairing Machine being Used to Break Up the Surface of the Road: The Cutting Tool and Engine are Mounted on a Swinging Beam Which Permits Operation over a Width of 8½ Feet

MECHANICAL WIPER AN AID TO STREET-CAR MOTORMAN

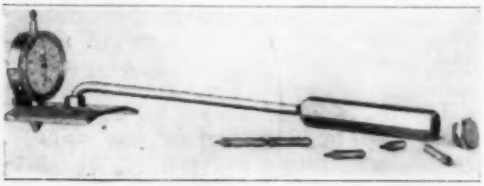
Much inconvenience is experienced by motormen when the glass window in front of them becomes obscured in bad

Mechanical Wiper That Enables the Motorman, by Slightly Turning a Handle within His Reach, to Keep the Window in Front of Him Clean in Bad Weather

weather, and consequently on the street cars of Milwaukee a simple mechanical wiper has been adopted. The wiper, in the form of a metal bar carrying a rubber strip, is mounted on the outside front of the car in such a manner that the motorman, by slightly turning a handle that is located inside the car, moves the wiper radially across the glass surface, and cleans a considerable area of the window. This wiper is installed on over 1,000 cars of the Milwaukee system.

ACCURATE CYLINDER GAUGE WITH REGISTERING DIAL

For the use of garages and small repair shops, a portable cylinder gauge has been developed. The diameter of the cylinder is measured between two contact points and any variations are shown by the pointer on the dial. Five contact points of different lengths are provided, which can be carried in the hollow handle.



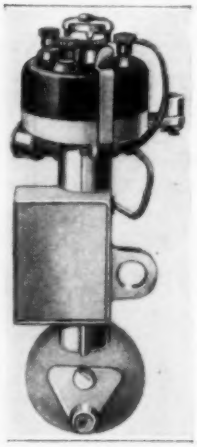
When This Gauge is Inserted in a Cylinder, the Diameter is Measured between the Contact Points, and Irregularities are Registered on the Dial

DENSE FORESTS OF RED CEDAR IN BRITISH EAST AFRICA

So greatly is the American production of pencil cedar decreasing that it is predicted that in the near future the only source of supply may be Kenya, in British East Africa. Kenya is a great volcanic mountain, the lower slopes of which are clothed with dense forests of red cedar, said to be the largest in the world. This source of supply is as yet almost untouched. The district can be reached by the Uganda Railway, and if low enough freight rates were provided, there is no doubt that a considerable export trade would soon be developed.

HIGH-CLASS IGNITION SYSTEM FOR POPULAR LIGHT CAR

A new ignition system has been devised for a well-known small car which can be installed without disturbing the regular wiring, and which, it is claimed, will eliminate most of the troubles caused by faulty ignition. With this new unit the vibrator points are no longer needed, as one set of breaker points in the timer performs all functions. The condenser of the unit is wired in series with the magneto in such a way that a strong uniform current is always available at the spark plugs even when the engine is running slowly, and this results in much smoother running of the car, which is always desirable.



GOVERNMENT SAVES FUEL OIL ON NAVAL VESSELS

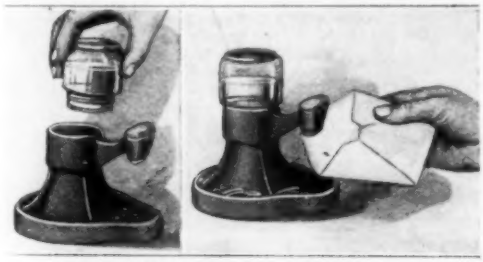
Economies in fuel-oil consumption aboard ship have been worked out by navy engineers. By changing the fresh-water distilling plants from high pressure to low-pressure double-effect operation and using exhaust steam for power, a saving of approximately nine tons of fuel oil per day was made on the battleships and three tons on the destroyers. At an average cost of $2.10 per barrel, this represented a daily saving of $141.75 on the battleships and $47.25 on the destroyers.

NEW SAFETY CODE AVAILABLE PERTAINING TO GRINDING

For the use, care, and protection of grinding wheels, a safety code, which has been in the course of preparation for two years, has lately been published. The sponsors of the code are the international association of industrial-accident boards and commissions, and the grinding-wheel manufacturers of the United States and Canada. The new code is said to be a distinct improvement over the others previously issued by the grinding-wheel manufacturers, and contains valuable information which is not to be found in any other publication.

ENVELOPE MOISTENER HAS TRAY FOR ACCESSORIES

Office and bank employes will appreciate a new envelope or finger moistener introduced by an eastern manufacturer, which has a metal base containing several handy trays for rubber bands, pins, clips, etc. The moistening pad is held in a bracket so that either the top or bottom may be used in sealing envelopes, sticking stamps, or counting money. A



Envelope and Finger Moistener: Left, Replacing Water Container after Filling; Right, Moistening an Envelope Flap

glass reservoir, easily removable for filling, is fitted into the top of the appliance, and the whole arrangement serves as an ornament to any desk.

HANDY AUTOMOBILE WASHER SAVES SOAP AND VARNISH

Specially constructed for use in washing automobiles, a newly invented bucket keeps the soapsuds always clean, and eliminates injury to the varnish on the car caused by undissolved soap, or what is worse, from the sand and gravel that is so often transferred from the dirty car to the water. While it thus saves all the varnish, it is said that it also saves half the soap. Inside a strong galvanized-iron bucket is a screen and soap container that are raised from the bottom of the bucket so as to leave a space beneath them into which any sand or gravel drains. The

Pail for Washing Automobiles: Left, Partly in Section, Showing Sand Screen and Soap Container; Right, Screen Removed from the Bucket, with Soap Container Open

soap container on top of the sand screen is cylindrical, and perforated so that all the soap must dissolve before it can get into the water. On the outside of the bucket are spring wire holders for sponges, which are thus kept off the floor.

SMALL PHONOGRAPH MOTOR FITS ANY INSTRUMENT

Winding a phonograph is tiresome to most people, and the introduction of a small electric motor, which has been designed to eliminate this work without necessitating any change to the machine, will therefore undoubtedly be appreciated. The apparatus is mounted on a base that permits it to be placed beside the phonograph turntable, which is revolved by a rubber wheel, or pulley, on the motor. The motors are manufactured for either alternating or direct current, at 110 volts, the average operating cost being but five cents per month; they are controlled by the speed regulator on the phonograph, and automatically stop when the record is completed.

At the Upper Left is Seen the Small Motor with Rubber Pulley, or Wheel, While at the Right It is Shown Mounted on the Phonograph

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

This Heater for the Sick Room Has a Small Electric Bulb Placed between Two Perforated Plates. A Fleece or Flannel Cover is Provided and a Heat Regulator is Connected in the Cord

A Water-Power Egg Beater That can be Attached to Any Faucet and Also Used for Mixing Small Cakes

Mop with a Small Wringer on It So That the Dirt and Water can be Squeezed Out: An Adjusting Spring Allows the Wringer Tension to be Set as Desired

Traveling Clothespin Bag Which can be Moved along the Line upon Wire Supports, Thus Keeping the Pins Clean and Saving Much Stooping

On This Wire Screen the Bread or Cake Cools with Air Touching All of Its Sides, Which Eliminates Sogginess

Combination Fork and Spoon Made of Aluminum can be Used like a Pair of Tongs for Lifting Hot Meat, Eggs, and the Like

Collapsible Enameled-Steel Seat for Baby, Which Has Straps for Attaching to Ordinary Chair or to the Seat of an Automobile

This Convenient Bag Has a Removable Compartment Containing the Necessary Toilet Articles Used While Traveling

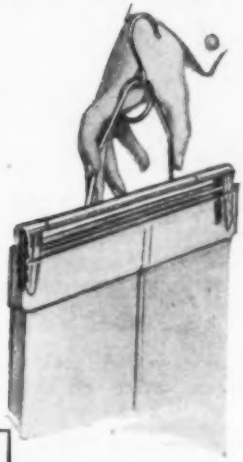
Anyone wishing further information on devices described in the editorial pages can

Two Views of a Metal Drapery and Curtain Support Which Allows the Side Draperies, Valance, and Lace Curtain to be Hung Independently

This Polished-Iron Griddle Has a Hollow Base Which Prevents a Gas Flame from Overheating the Center, and Distributes the Heat Evenly

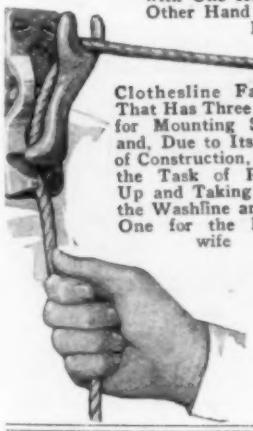
Potato Masher and Beater Made of One Slotted Bar Inserted in a Handle: The Curve in the Mashing Surface Gives Great Strength to the Appliance

This Electric Cooker Is of Light Construction and Is Especially Valuable in Sick Rooms. Besides the Oven Which is Used to Cook Steaks, Chops, Fish, and the Like, This Appliance Has a Griddle Fastened to One Side and a Hot Plate on the Other



Trouser Hanger Which Works on a New Principle, as the Supporting Parts are Placed inside of the Garment and Leave No Mark

This Rolling Pin is Operated with One Hand, Leaving the Other Hand Free to Sprinkle Flour

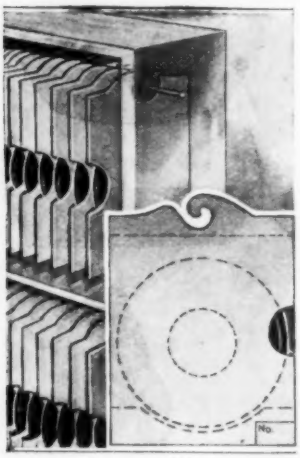


Clothesline Fastener That Has Three Holes for Mounting Screws and, Due to Its Form of Construction, Makes the Task of Putting Up and Taking Down the Washline an Easy One for the Housewife

Convertible Porch Swing and Hammock Which is So Constructed That the End Members can be Shifted Readily from the Normal Vertical Position to an Inclined or Horizontal Position

HANG UP PHONOGRAPH RECORDS IN FILING ENVELOPES

A new device for filing phonograph records has been patented in Germany and consists of a heavy paper envelope having a cardboard hanger at the top. The bottom edge of the envelope is also of cardboard so formed as to prevent the record from rolling out. Space is provided for indexing on the lower corner of the envelope, so that the figures are plainly visible when the records are hung in the cabinet.



DOOR HINGE SAVES FINGERS FROM BEING PINCHED

Pinched fingers are a common occurrence when children play near a door, and to prevent this painful injury, an inventor has constructed a new door hinge. The invention consists of two bases or plates, which are attached to the door and casing respectively, and integral cylindrical knuckles that have a pivotal connection between the plates. A three-quarter round brass tube is fitted over the corner of the door casing between the hinges and at the ends, thus closing the space which is found upon opening the ordinary door.

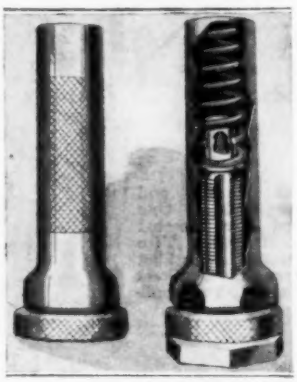
¶When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

WARSHIPS TO BE CONVERTED INTO A BREAKWATER

Instead of entirely scrapping 12 of the warships that have to be destroyed in accordance with the terms of the armament conference, recently held at Washington, it is proposed to turn them to profitable use by taking them to Los Angeles, and sinking them so as to form an extension of the San Pedro breakwater. It is claimed that in this way shelter would be provided there for eight additional active battleships.

ONE-QUARTER TURN REMOVES NEW THREADLESS DUST CAP

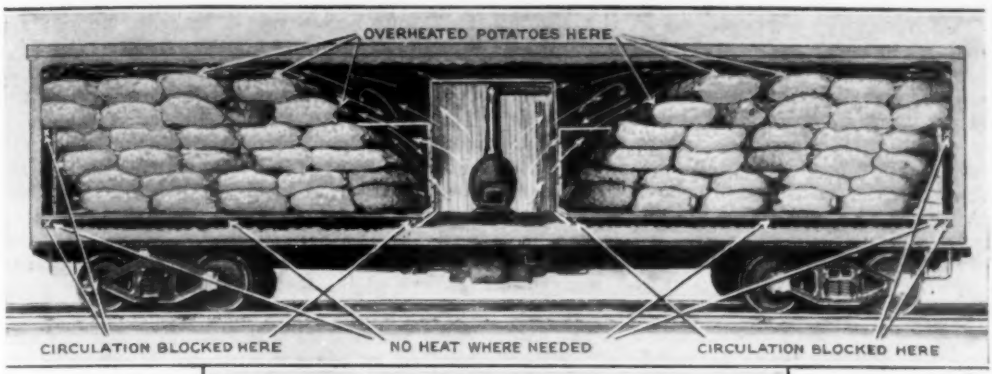
Threaded valve caps on automobile tires that have to be removed by a somewhat lengthy process of turning consume time, and are liable to stick. Now there is a threadless dust cap that avoids both these drawbacks. A quarter turn removes both valve and dust cap at once. The cap case is forced by a coiled spring upward against lugs on the base nut, and a quarter turn brings the lugs opposite slots in the cap and releases it.



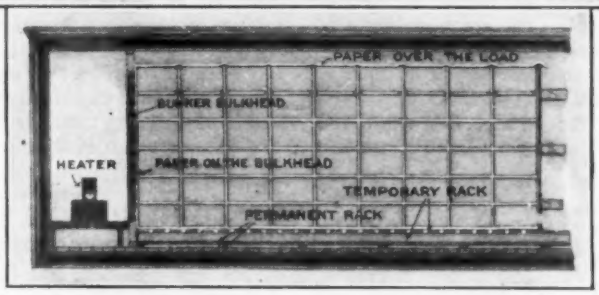
"SHORT-LEGGED" FURNITURE LEVELED BY CASTER CUP

Furniture having one short leg is a source of constant annoyance in any home, and as a remedy for this common fault, a caster cup has been produced. The cup consists of two parts, each threaded so that the upper part screws on the outside of the lower. The legs of the table, dresser, etc., are placed in the cup-shaped top, and in the event of any side being low, that particular cup is screwed up until the article stands level. The device is equally useful, if the floor is uneven.

CONVERT REFRIGERATOR CARS FOR WINTER USE



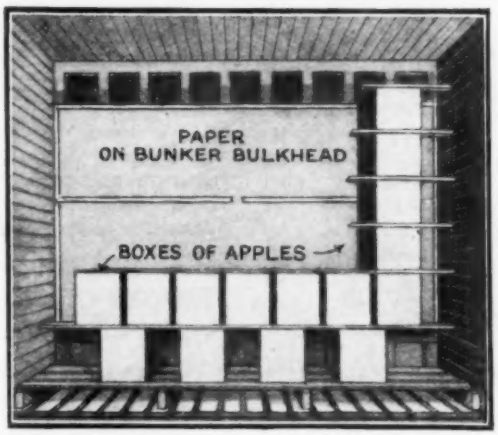
Above: In the Heated Box Car, as Ordinarily Arranged, the Freight near the Stove is Overheated While Other Portions of the Load Freeze

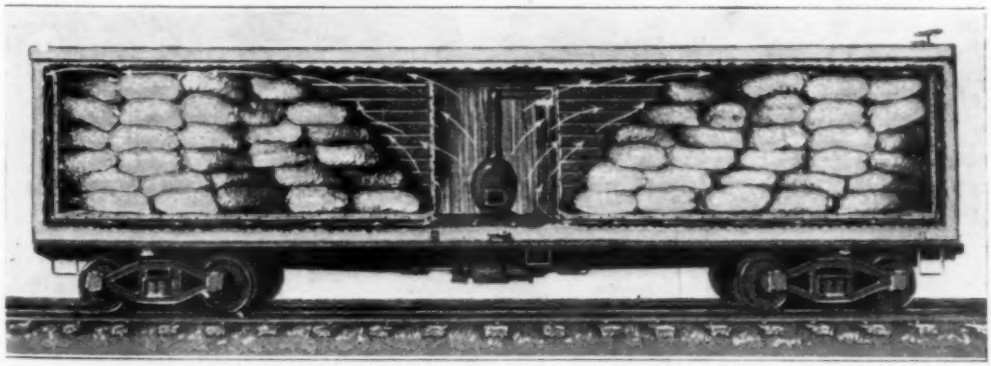


Left: From the Heater, Warm Air is Circulated around the Load. Below, the Lower Tier of Boxes is Spaced to Form Passages

Converting a refrigerator car into a heater car for perishable freight during freezing weather, is a recent accomplishment that makes possible not only the utilization of thousands of refrigerator cars in the winter months, but a saving of the $2,000,000 of perishable products annually lost on account of freezing while in transit.

The conversion is made simply by providing an uninterrupted passage-way all around the load in a car, so that a constant and uniform circulation of warm air from a heater in the center of the car can reach all parts of the load. It is merely a recognition of the fundamental principles of the movement of hot and cold air. When the circulation of warm air is obstructed, the produce at the top of the car is overheated, while that at the bottom of the car freezes.





In a Properly Converted Box Car the Protecting Heat from the Stove Rises to the Top of the Car and Circulates around the Load, Returning along the Passage Formed between the Temporary Rack and the Car Floor, Thereby Insuring a Proper Temperature in All Parts of the Lading

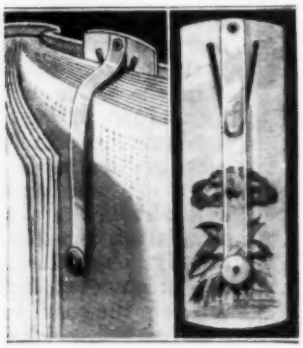
To overcome obstructions in the shape of high splashboards at the bottom of the bunkers, and floor racks with transverse supporting strips instead of longitudinal strips, an additional floor rack, with longitudinal stringers not less than four inches high, is placed upon the permanent floor rack. This temporary rack is papered to the center of the car. Open bulkheads are also papered from just below the openings near the ceiling of the car to the top of the first layer of boxes next the bunkers. Bunker bulkheads of the solid type with open spaces at the top and bottom need not be papered.

In loading, the first or bottom layer in the stacks of boxes next to the bunkers consists of only four boxes, spaced so that the bottom boxes in the second stack cannot slip into the spaces between the boxes in the first stack. On top of the first four boxes two 1 by 6-in. boards are nailed to support the remaining five layers. When the car is fully loaded, paper is placed across the top of the load as far as the bracing in the center of the car, so that warm air from the heater will move to the center of the car before returning to the bunkers. When possible, the ice grates in the bunkers are raised and the heaters placed on the floor of the bunkers, thus providing a lower plane from which the heaters can draw their supply of cold air.

By the use of this system of lining and loading refrigerator cars, adequate control of fruit temperatures can be secured, no matter how low the outside temperature may be. The same principles applied to box cars enable that class of equipment also to be used in heater-car service, with no danger of loss by freezing.

NEAT, PRACTICAL BOOKMARK INVENTED BY BLIND MAN

An eastern man, who is totally blind, has produced a neat and practical bookmark with a celluloid base, to which is attached a thin strip of isinglass having a small lead weight on the end of it. The base is affixed by means of a V-slit to the top of the back pages, and the strip is then placed on the page being read. When one page is turned, the weighted strip falls back to the second, so that there is no danger of the reader losing his place if the book is hurriedly closed.



PROPOSED OIL-PIPE LINE FOR ARGENTINA

Feeling that the Commodoro Rivadavia oil fields in Argentina are sufficiently proved to justfy the expense, it is now proposed to construct an 8-in. pipe line from the field to Buenos Aires for transporting the oil. The distance will be nearly 850 miles and the carrying capacity of the pipe almost double the actual production of the wells at the present time, but new development may alter this.

TWO NEW DYES DISCOVERED IN COAL-TAR PRODUCTS

A new chemical reaction which can be employed in making dyestuffs from coal-tar products has been discovered by a Canadian university professor. Two new compounds, one a blue and the other a beautiful shade of rose, have been produced. The professor is now engaged in determining definitely the chemical constitution of these compounds, and in devising methods for their production in quantities suitable for manufacturing purposes.

PISTON OF IMPROVED DESIGN SAVES OIL AND GASOLINE

Pistons for automobile motors that are guaranteed never to cut or wear the cylinders out of round, and to reduce the gasoline bills from 30 to 50 per cent, and the oil bills from 60 to 80 per cent, have several novel features that are claimed to be the cause of this superiority. Screwed on the body of the piston are a head and a liner, with an asbestos gasket between them, that keeps the body from becoming heated. These are made of aluminum. Under the head in a groove is a three-piece piston

ring, made of special low-friction metal, behind which are asbestos packing and a vanadium-steel spring, which seal the piston-ring groove, and prevent oil and gasoline leakage.

WHY BACTERIA IN THE MOUTH ARE GENERALLY HARMLESS

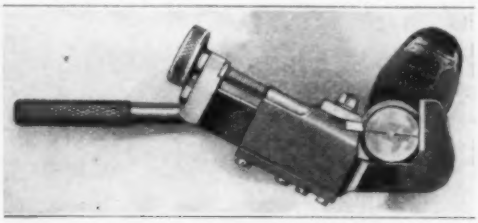
It has hitherto been assumed by pathologists that the bacteria which are known to lodge in the cavity of the mouth in seething masses are disease producing, and that they are always present to take advantage of any unfortunate lowering of the powers of resistance in the human body. It has now been demonstrated by a professor at Johns Hopkins University that although the oral cavity has no elaborate system of hairy membranes like the nose and air passages, to rid it of bacteria and foreign particles, nevertheless it does the same thing by a mechanical action of the muscular structures around the mouth that set up suction currents which remove any bacteria or foreign particles from the mouth in from 15 to 30 minutes. These suction currents carry the bacteria uniformly toward the rear of the mouth, without any lateral or forward dissemination, and pass on without lodging on the tonsils or the walls of the pharynx—the pouch that forms the back part of the mouth.

ARTIFICIAL PLASTIC WOOD JUST LIKE REAL TIMBER

An artificial wood that is so like the real thing that it can be worked with carpenters' tools and finished with a file or sandpaper, is now being produced by an English manufacturing company. The material is known as plastic wood, and at first it has the consistency of a thick paste, and can therefore be molded into any shape. It can then be hardened by exposure to the air, and becomes a tough, solid, waterproof substance. It is expected to be of special use for making patterns for castings. It can also be used for filling in flaws in timber, or openings at joints, and will take paint, stain, or varnish like real wood.

ADJUSTABLE CRANKPIN TOOL EASY TO OPERATE BY HAND

Worn, or out-of-round, crankpins can be trued up with a new hand tool, without removing the motor from the car, in

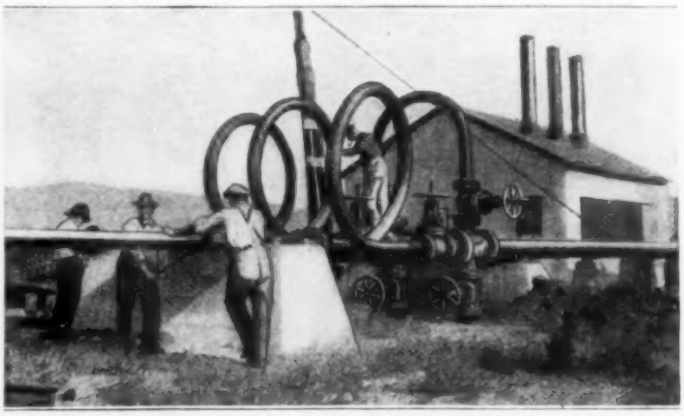


Tool for Truing Up Worn or Out-of-Round Crankpins on Automobile or Stationary Engines without Removing the Crankshaft: The Feed Screw Adjusts the Cutting Blade

the case of an automobile, or when the motor is on the bench, without having to remove the crankshaft. The tool has a jaw which grasps the crankpin, and which on one side has a cutting blade that is always radially opposite to the point of the crankpin on which a hardened back plate on the jaw bears. Extending from the cutting blade is a feed attachment, and the setting of the feed screw in connection with this is the only adjustment necessary.

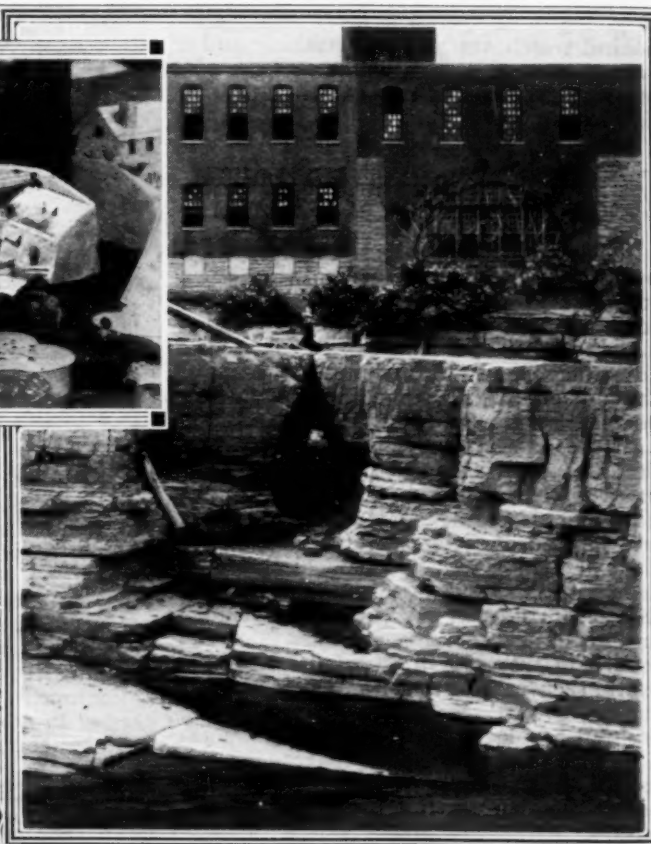
PIPE COILS RELIEVE TENSION CAUSED BY EXPANSION

In long pipe lines for carrying oil the difference in length due to expansion and contraction is a very serious matter and must be compensated for by some means. One of the most simple methods is by forming, at intervals in the line, large coils which allow for expansion and contraction without damage to the pipe line.



When the Pipe Line Expands on Account of the Heat, the Large Coils Compensate for the Increased Length and Prevent Damage

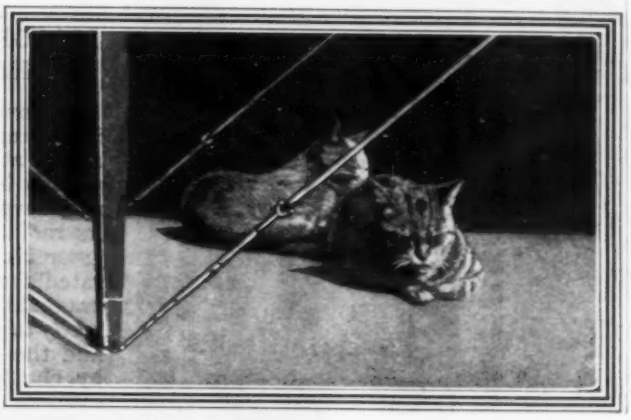
Here Is Decidedly the Sweetest House in the World, or at Least Sweeter than Any Other Unless It is Built as This One is—Entirely Out of Candy. The House, with Its Waterwheel and Its Interesting Surroundings, Is of Home-made-Candy Construction, Built by a Candymaker in Cincinnati, Ohio. It was Exhibited in This Manner in a Show Window



Any Boy or Girl Who has Read —and There cannot Be Many Who have Not—Fenimore Cooper's "Last of the Mohicans" will Remember the Historic "Cooper's Cave" at Glens Falls, New York, Where the Author Himself Hid from the Indians. Here Is the Cave, or Rather the Entrance to It, on the Bank of the Hudson River. From This Pear-Shaped Entrance, Seen in the Center of the Picture, a Winding Staircase Leads to the Cave Itself

Joy-Riding by the Dozen: This Is Not a Case Where Two Is Company and Three Is a Crowd—Quite the Reverse, the More the Merrier. The Wee Bit of a Traction Engine Is the Work of a London, England, Inventor, Who Recently Caused Quite a Sensation by Appearing on the Streets in This Manner with a Wagon Load of Enthusiastic Youngsters. The Tractor Was on Exhibition at the Horticultural Hall, Westminster

This Carriage Glides over the Snow in the Same Manner That Speed Wagons Roll over the Ground, by Moving the Handle Back and Forth. It Has a Saddle like a Bicycle, Where the Rider Sits and Grasps the Handlebar with Both Hands

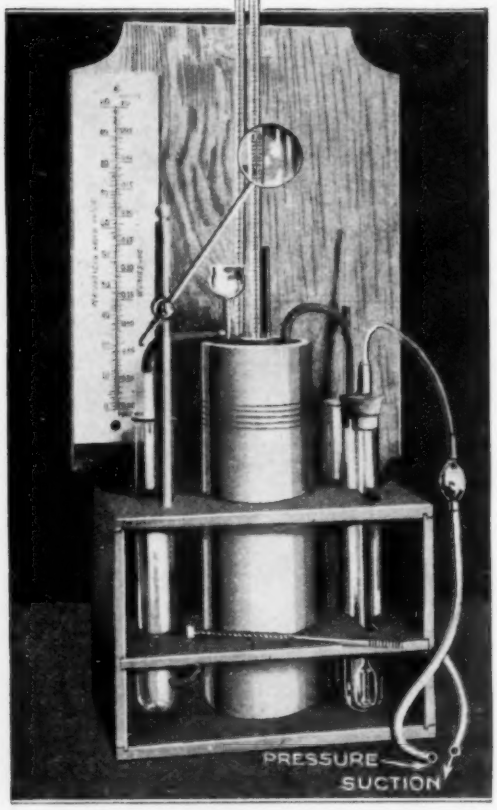


Three Kittens That Are the Petted Mascots of the Air-Mail Hangar at Omaha, Nebraska: Being Bearers of Good Luck, They are Allowed to Go as They Please Anywhere and Anyhow in the Hangar, or over the Airplanes, in Which They have Made Many Flights. The One at the Left, Seated on a Tailplane, is Called "Spark," and Is Yellow—in Color Only, Not in Any Other Sense. The Two at the Right, Called "Contact" and "Tailskid," are Reposing on the Wing of an Airplane

At the Left Is Willetta Huggins, Wisconsin's Blind and Deaf Super-Girl, Chatting with Helen Keller, the World's Most Widely Known Deaf and Blind Woman. In Many Ways They Are Two of a Kind, but Not as Regards Their Methods of Listening. Miss Keller Does It by Holding Her Fingers to the Speaker's Lips, While Miss Huggins Rests Her Finger Tips on the Speaker's Chest

APPARATUS THAT TESTS MILK FOR ADULTERATION

Adulteration of milk is easily determined by the use of an appliance invented by a Minnesota chemist for the purpose of measuring the freezing point of liquids. As the



Apparatus for Determining the Percentage of Milk Adulteration, Showing the Thermometers, Test Tubes, and Heat-Retaining Bottle

freezing point of milk is —.55° Centigrade (very nearly 1° F.) below that of water, the sample to be tested is placed in a vacuum tube, similar to a heat-retaining bottle, and cooled by means of an air and ether mixture. If the milk freezes before it has been cooled to a temperature of 31° F., the presence of water in excess of the normal is evidenced, and the percentage of additional water can be calculated by means of a properly calibrated scale.

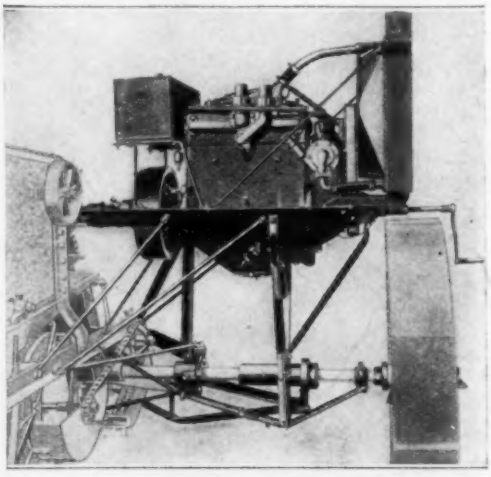
¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

VEGETATION CLOTHES ISLAND ONCE A BARREN WASTE

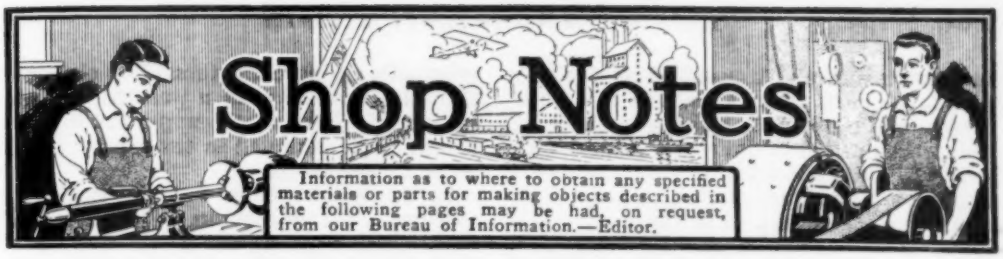
The island of Krakatoa, off the west coast of Java, has provided scientists with a natural experimental station for the study of the methods by which islands are supplied with animal and vegetable life. In August, 1883, the island was the scene of one of the most violent volcanic disturbances ever recorded, one result of which was the destruction of all forms of life on the island. Since that time it has been closely watched by scientists who have studied the return of life to the island through natural agencies. A recent expedition disclosed that the island was covered with a dense vegetable growth and that 175 different species of animal life were present.

MOTOR TO OPERATE COMBINED HARVESTER-THRESHER

A power plant to operate a combined harvester-thresher independently of the speed at which the machine is hauled, usually by a tractor, over the ground is a new development. A gasoline engine, with its radiator tank and other equipment, is assembled on a frame that can be separated from the harvester-thresher. The crankshaft of the motor is coupled directly to the cylinder shaft of the thresher, and the other operative parts are driven by chains from the opposite end of the cylinder shaft. The speed with which the machine is operated can be regulated by the motor control.



Power Plant That Operates a Combined Harvester-Thresher by Direct Connection to Its Cylinder Shaft, Independently of the Speed at Which It is Hauled over the Ground by a Tractor

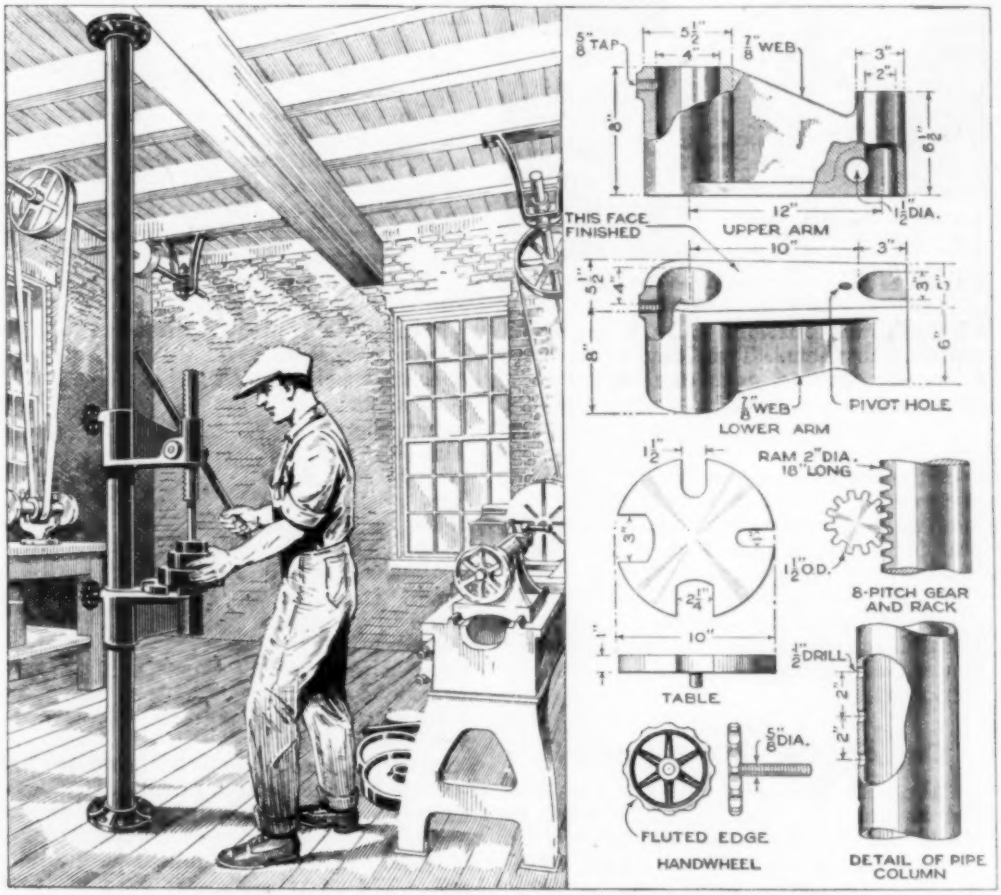

Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

An Arbor Press of Large Capacity

By J. V. ROMIG

EVERY machine shop or garage doing any considerable repair work has an arbor press as part of its equipment. Most of those that I have seen and used, however, have been small, and of very little, if any, use for long work. The press described herein was designed and built by the writer with this in view, and the result is a press of large capacity, adjustable over a wide range, but not too clumsy.

The main member is a length of 3½-in. pipe, which has an outside diameter of 4 in.; it is drilled with a row of ½-in. holes, 2 in. apart, and fitted with a floor flange at each end, the over-all length being the same as the height of the ceiling from the floor. The upper and lower arms are castings, made from simple patterns; the upper arm is bored to fit the rack and gear. The rack and gear are eight-pitch,



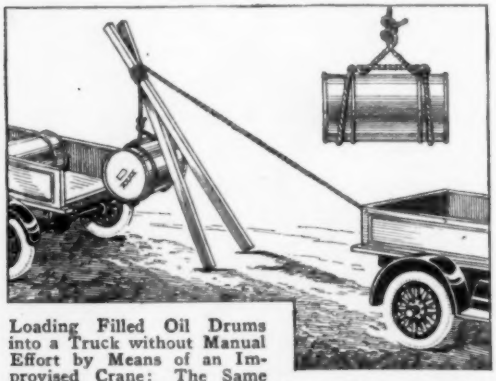
An Arbor Press Suitable for Any Shop or Garage Where a Wide Range of Work is Handled: The Upper and Lower Arms may be Clamped Anywhere on the Column, to Suit the Work or the Operator

and are made and assembled as for any ordinary press. They should be of a good tough grade of steel. The gear may be fitted with a two or four-spoke handle, as desired. Care should be taken, when boring the rack and gear holes, to bore them so that the teeth will mesh correctly. The lower arm is faced on the upper surface, and drilled for the pivot on the table. The table is also a casting, or may be made of steel plate, if a large enough piece is available; it is slotted, as shown, for work of varying diameters. The clamping screws are made with a pointed end; by means of these, both upper and lower arms can be clamped in the most suitable working positions.

If the height from floor to ceiling is too great for a column, or if overhead cranes are used in the shop, a base of large diameter can be substituted for the lower floor flange, and the pipe column cut off and braced at a height that may be most convenient.

An Improvised Crane

In loading some heavy barrels of kerosene, the driver of a truck used a simple method of elevating them to a height



Loading Filled Oil Drums into a Truck without Manual Effort by Means of an Improvised Crane: The Same Idea can be Adapted to Other Work Where a Vertical Pull or Lift is Required

where it was possible to back the truck underneath them. Two long sticks were fastened together, near one end, with a rope, and the opposite ends were placed on the ground about 3 ft. apart. A rope was slung around the oil barrel, passed over the crotch of the sticks, and fastened to the rear axle of a second truck. By moving the second truck forward in low gear for a few feet, the barrels were lifted to a corresponding height, when the truck that was to carry them was backed underneath and the load lowered. The same method can be applied to lifting heavy stones, or other work.—G. A. Luers, Washington, D. C.

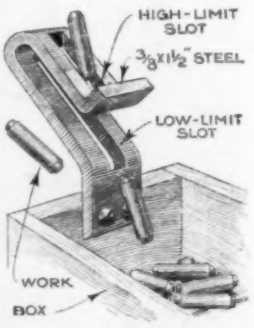
Care of Wheel-Truing Diamonds

Take only light cuts with the diamond, and as the stone wears, turn the nib in the holder to insure uniform wear; then when the stone wears down to the metal setting, reset the stone so as to expose a new cutting surface. When the diamond is worn down to a small size, reset it in a holder, and use it in the tool room. Be careful not to jam the diamond into the wheel, and instruct operators not to allow the stone to get any violent knocks, as it is very hard and therefore brittle. Never use a diamond dry, except on small wheels for internal grinding, or on tool or cutter wheels; on large wheels for cylindrical or surface grinding, direct a copious stream of water on the diamond at the point of contact with the wheel.

Work Gauged Automatically

The gauge shown in the drawing will be found applicable to many classes of work and will save the time necessarily required for a separate gauging operation; in addition, it prevents the machine hand from turning out work that is afterward found to be incorrect.

The work shown is a sleeve with beveled ends, the outer diameter being held within limits of plus or minus .01 in. The gauge is made of ⅜-in. flat steel, the first operation being to bend it into the form shown, the angle being about 45°. The slots are next milled, the high limit or "go" slot being milled so that the ends, when the gauge is fixed in place, stand in a vertical position, to prevent the work from falling through, back end first, and probably sticking. The low limit or "not go" slot is milled in the bottom portion. It may be as well to say that in cutting the slots, the gauge should be strapped on the table, on its side, and both slots milled with an end mill. The same method is used in grinding the slots to the finished size.

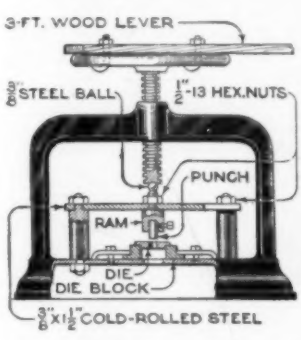


Two holes, drilled and countersunk, ac-

commodate screws that hold the gauge to a wooden box. As the operator cuts off the pieces in a screw machine, he catches them in one hand and places them in the top of the gauge. If the work is below the high-limit size it drops through the slot, and if above the low limit, slides down the slot into the box. If above the high limit, the piece will not drop through the first slot, while if below the low limit, it drops through that slot and onto a piece of tin, where it immediately attracts the operator's attention.

Punch Made from Letter Press

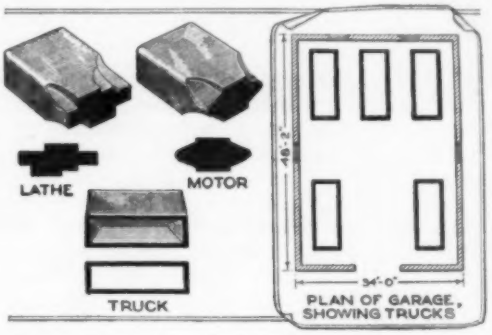
The letter press illustrated was used to good effect in an emergency when it was required to punch 1/16-in. cold-rolled stock with holes up to 1/2 in. in diameter. In drilling the holes in the base of the press, the yoke was removed; holes were cut underneath the die and in one side of the bed so that the punchings could be removed. The die is held to the bed by clamps, while the ram is bolted to a strip of thin steel supported at the proper height at each end. The punch and die being in line with the screw, a cavity is made in the upper end of the ram screw for a steel ball, which furnishes a hardened bearing and reduces the friction. After extensive use, the horizontal piece of steel holding the ram and forming a spring was not permanently bent, as the amount of deflection was not more than 3/16 in. The extra leverage required to force the punch through the work was obtained by bolting a wooden lever to the handwheel of the letter press.—Dexter W. Allis, Whitman, Mass.



¶A "circular mil" is a term used in electrical wire measurements and is the area of a circle .001 in. in diameter. The expression "circular inch" is also met with in electrical measurements and is the area of a circle 1 in. in diameter. Hence a circular inch is equal to 1,000,000 circular mils. The circular inch is equal to .7854 sq. in., and a square inch equals 1.2732 circular inches or 1,273,239 circular mils.

Rubber Stamps for Floor Layouts

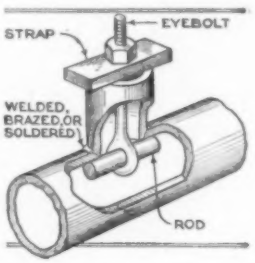
Frequently, in engineering offices, it is desirable to make preliminary plans in order to show officials or clients a suggested floor layout. For example, a garage of certain dimensions is proposed; this can be outlined in a few minutes, but then the inevitable question, "How many automobiles will it accommodate?" is asked. An ordinary pencil eraser is cut to represent the space that will be occupied by the car on the scale drawing, and, using it as a rubber stamp, the entire available area may be stamped quickly to show its car capacity. In a similar manner, stamps to indicate electric motors, grinders, planers, or other tools and machines, can be made and used to indicate, on the floor plan of a factory, various arrangements to obtain the greatest economy of space.—Robert W. Shelmire, Chicago, Ill.



Rubber Stamps Cut from Erasers Prove Useful in Laying Out Floor Plans

Clamp for Welding and Brazing Tees

A clamping tool that consists of an eyebolt, rod, and strap is of special service in holding two sections of pipe together at right angles for welding, soldering, or brazing. All parts of the clamp are generally available, and it is applied to the work as shown in the drawing. This type of clamp is of particular advantage in brazing, where the main requirement is to hold the parts without the least movement until the molten spelter sets, since otherwise the joint is invariably a failure.



FAULTS IN CONCRETE-SIDEWALK CONSTRUCTION

By A. J. R. CURTIS

ONE of the greatest factors in the tremendously increased use of Portland cement in the last 40 years has been the concrete sidewalk. Although the concrete walk took the country by storm about the time Dewey fought the battle of Manila, and has maintained first place ever since in popular favor, a number of ordinary errors in construction still persist. Some of these mistakes are serious in their consequences, as shown in Fig. 2, endangering life and limb, and causing much needless expense. All, however, are easy to avoid, as the principles involved in laying sidewalks are simple, and the technique easy to acquire.

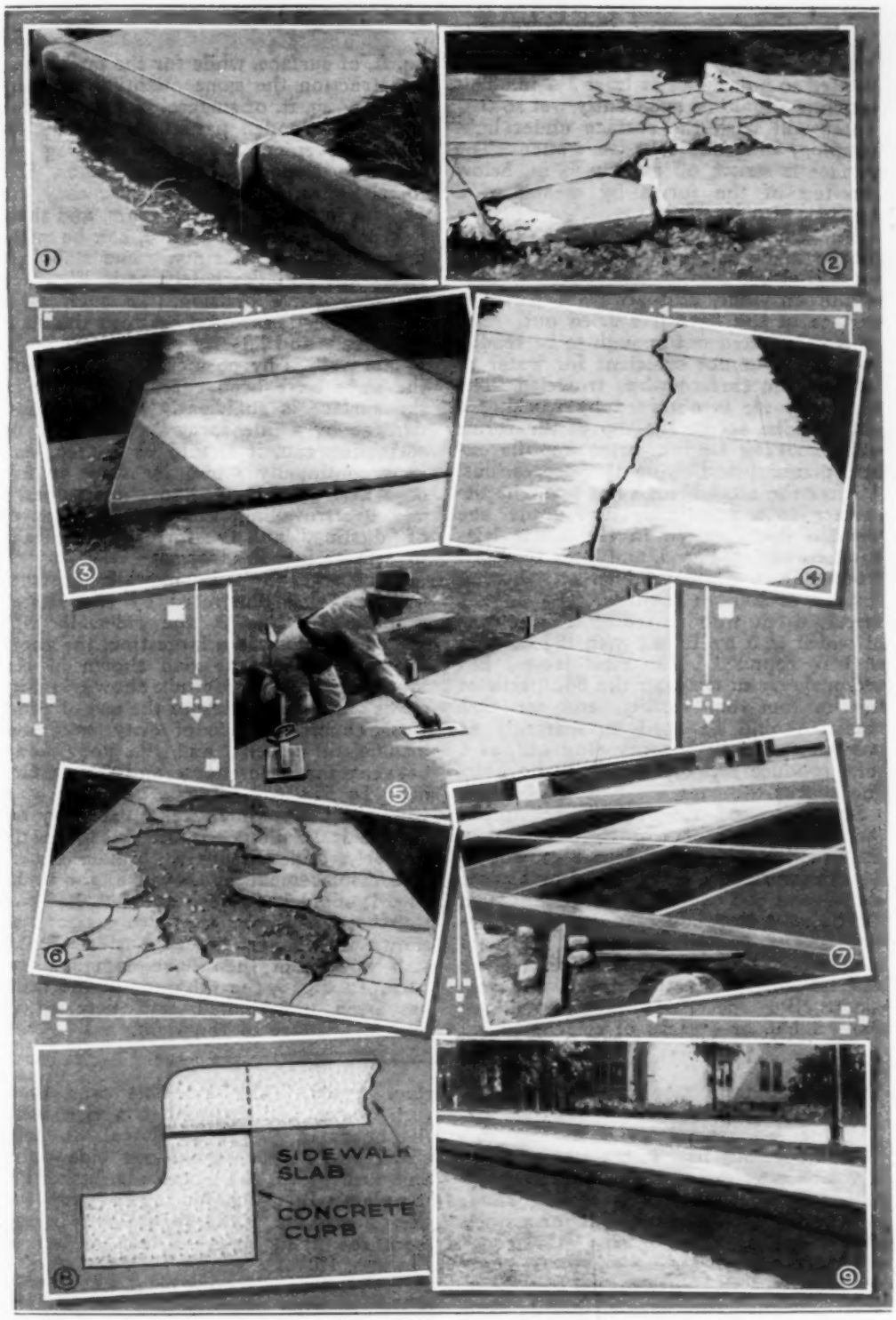
A concrete sidewalk should be merely a collection of independent concrete slabs, laid one beside another on a firm, well-drained subgrade. In locations where surface water disappears quickly and cannot become trapped under slabs, walks are frequently placed directly on the ground. If the slabs are laid where water is likely to become pocketed under them, either a subgrade, consisting of a 6-in. layer of cinders or gravel, or tile drainage, must be used to prevent possible heaving from frost. Where the walk is placed on an earth fill or elevation, the latter must be thoroughly compacted, and in the case of clay, or other water-bearing soil, the use of a cinder or gravel subgrade under the concrete is a wise precaution. Fills should extend at least 1 ft. beyond the walk on either side and the edges should slope off at an angle of 30°. The finished subgrade should slope toward one side at a pitch of ⅛ in. to the foot, and the finished walk is usually given a corresponding pitch.

Some of the common mistakes in sidewalk construction are shown in the accompanying illustrations. Failures due to disregard, or ignorance, of the law of expansion and contraction, as illustrated in Figs. 1 and 2, and of proper concreting methods, as in Fig. 6, are the most common. Concrete has an expansion coefficient of about .00001, which means that for every degree Fahrenheit in temperature change a piece of concrete will expand or contract approximately one hundred-thousandth of its length. As a practical illustration, a sidewalk 100 ft. long has an actual variation in length of about 1.2 in. between the extreme temperatures of zero and 100° F. If this walk were put down when the temperature was at 50°, it might be expected to expand one-half of the above amount if the thermometer reached 100°, and to contract as much from its original length if the temperature reached zero. Expansion in sidewalks may be provided for in ordinary straightaway work by leaving a space of from ⅜ in. to ½ in. between slabs every 50 feet.

If a long piece of sidewalk is constructed in the summer, without dividing it into separate slabs, the contraction in cold weather will be sufficient to make the walk tear itself apart at one or more places, and the opening thus formed will continue to widen as the sections continue to shrink. The remedy for this, as well as for several other sidewalk difficulties, lies in making the walk a series of disconnected slabs, usually not more than 6 ft. in each surface dimension, no slab to have a greater length than twice the width. Such slabs can take whatever little movement may be required without affecting adjoining slabs. A very effective method of producing a positive division between the slabs is illustrated in Fig. 7, which shows how the slabs are laid alternately.

The need for efficient concreting methods has always been apparent in our sidewalks. Slipshod methods have been due largely to a failure to realize that the sidewalk really constitutes a very exacting use of concrete. The apparent simplicity of the thing invites careless methods. Sidewalk slabs are quite thin for their size, probably averaging less than 4 in. in thickness, exposing large areas to extreme conditions and often hard use without any protection whatever.

In starting to lay the walk, 2 by 4-in. forms are staked firmly to the desired level, the subgrade having been properly leveled, with its surface 4 in. below the grade of the finished walk. Concrete, made of approximately 1 part cement to 2½ parts torpedo sand, and 5 parts of gravel or crushed stone, all pieces of the



In Figs. 1 and 2 are Shown the Result of Expansion; Fig. 3, a Sidewalk Slab Forced Out of Place by Tree Roots; the Sidewalk in Fig. 4 Failed Because of a Poor Subgrade, While That in Fig. 6 was Made of Weak Concrete, with Dirty Materials, and in Fig. 9 the Subgrade has been Undermined. Fig. 5 Shows the Use of the Trowel, and Fig. 7 the Proper Method of Laying the Walk. Curbs should be Cast as Shown in Fig. 8, to Prevent Their being Pushed Outward by the Expansion of the Walk

latter above ¼ in. in size, is then deposited to a depth of at least 3¼ in. This concrete should be sufficiently wet so that water will flush the surface under light tamping, and should be no wetter. The surface is struck off exactly ¾ in. below the top of the forms by means of a notched straightedge.

The surfacing course, composed of a mortar made of 1 part cement to 2 parts sand, is placed on the base course, usually within an hour, and always before the surface of the base has dried out. The mortar is mixed wet enough to be readily workable, but not sufficient for water to flush to the surface when troweled. The surface grade is obtained by working a straightedge across the top of the forms with a zigzag motion, removing the excess material and filling the depressions.

After the straightedge has brought the surface to a practically true grade, the wooden float, shown in the lower left-hand corner of Fig. 5, and later the steel trowel, are used to produce a true, even surface of smooth texture. The float is merely a flat wooden trowel, the surface of which is 5 by 15 in., with the corners slightly rounded. The steel trowel has the property of drawing the fine particles to the top very readily, and for that reason should be used as sparingly as possible, as excessive troweling will, as a rule, produce slippery surfaces and hair-line checks.

Single-course sidewalks are made throughout their entire thickness of a single mixture—usually 1 part cement to 2 parts sand and 3 parts gravel or broken stone—and are usually 4 in. thick. It is not possible to produce as smooth a surface as in two-course work, but less material is required, and quite a little less labor. In practice, the two-course construction described above requires about 1 bbl. or 4 sacks of cement for 45 sq. ft. of surface, while for the one-course construction the same quantity produces about 47 sq. ft. of surface. Metal division plates or wooden partitions provide the most convenient means of dividing the forms to produce independent slabs. The metal plates are better because they can be kept in position a few hours, and then, if kept clean and well oiled, can be withdrawn without difficulty. The slabs are frequently laid alternately, as in Fig. 7, to secure positive division. In such cases heavy paper is inserted between the slabs previously and latterly placed.

The walk is by no means finished until the slabs have been cured. As soon as the surface is sufficiently hard to resist damage by a fine spray from a hose or sprinkling can, it should be wetted, and kept continually moist for four or five days at least. Failure to cure properly, and overtroweling, are the chief causes of "dusting," and the former often leads to definite loss in strength.

Some other faults in sidewalk construction are well illustrated by the photographs. In Fig. 3, the sidewalk was placed too close to a large tree, the roots of which raised the slab shown in the foreground. The sidewalk shown in Fig. 6 was a failure because of the use of poor, weak concrete, made of dirty materials, insufficient cement, and the poor bond between the base course and the surfacing. In Fig. 4 is shown the effect of a poor subgrade, which has sunk away on both sides, failing to support the walk properly, and causing a "broken back." The displacement of the curb, shown in Fig. 1, could have been avoided, had the slab been laid over the curb section, as shown in Fig. 8; the expansion of the slab would not then have damaged the curb. In Fig. 9, the subgrade of the walk has been undermined, and may cause eventual failure of the walk.

Shortening Rivets in Quantities

We needed some rivets, ½ in. long and ⅛ in. thick, but found that the stock of this size was exhausted. There was a large supply of longer rivets on hand, however, and rather than wait for a stock of rivets of the proper size, it was decided to cut down the long ones. A number of ⅛-in. holes were drilled in a ½-in. steel plate, and another and thinner steel plate of the same length and width was also provided. In use, the rivets were inserted in the holes in the drilled plate and the second plate placed over the rivet heads. The assembly was then turned over and clamped in a vise, with the heads of the rivets down. A cold chisel was sharpened on one side only, and used to cut the rivet ends flush with the plate. In using this method, precaution should be taken to prevent injury from the flying ends.—Frank Jablecnik, Chicago, Ill.

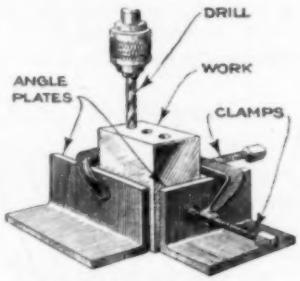
¶The average consumption of coal in steam boilers is 12 lb. per hour per sq. ft. of grate surface; there are 9 sq. ft. of heating surface to each square foot of grate surface.

Rocker Lever for Overhead Valves

Under the above title, on page 158 of our January, 1922, issue, we published a short article describing a tool for removing the tappet rods of an overhead-valve motor. We did not know at the time that this was patented; we have since been informed that it is, and our readers are therefore cautioned against making any tools similar to this.

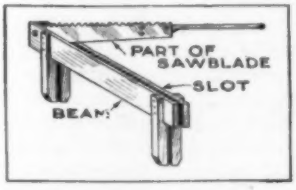
Clamping Work

Usually one angle plate is applied to clamp work held for drilling or other operations, with the result that, while the work is held square on one face, it may easily tip in the opposite direction. In fact, so readily will the work tip that the workman commonly uses a square to find whether or not it is true. All this takes time, and he has to tap the work with a hammer until he gets it just right. He then gives a final straightening twist to the clamp, and away the work slips again, not much perhaps, but enough to do considerable damage. With the use of two angle plates, all this is avoided, as the faces must be square with each other if the angle plates are square. The one clamp grips slightly lower than the other.



Header for Kafir Corn

One of the best things to use for the blade of a kafir-corn header is an old crosscut or one-man saw. The back of the saw is sharpened by grinding, and the blade is then mounted, back down, between two 2 by 6-in. pieces, these being held a sufficient distance apart by washers, to leave a slot for the blade. Four legs are provided on the ends of the header so that it may be placed over the edge of the wagon box.—R. E. Deering, Clements, Kan.



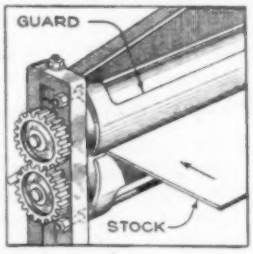
Portable Electric Testing Unit

An electrical testing unit consisting of four dry cells, with one test lamp, and two pointed terminals on flexible leads, is contained in a carrier made from an empty oil can and provided with a handle for carrying.

Two sides of the can are cut off level with the top of the battery and the remaining sides cut as shown. The test lamp is mounted inside, on a wooden block, to prevent breaking. The wooden handle, which can be made from an old broomstick, is fastened to the carrier by a screw at each end. Two holes are drilled through the handle, into which the terminals are inserted to keep them out of the way when the set is not in use, and to prevent short-circuiting of the battery.

Guarding Machine Rolls

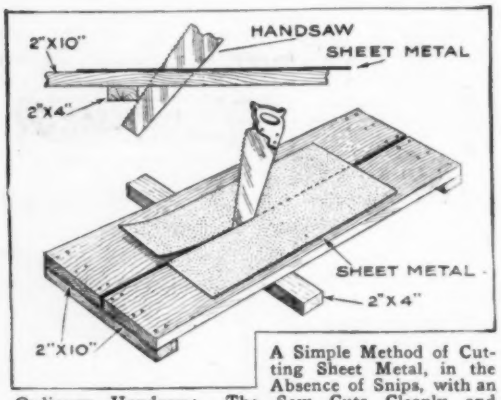
Any machine that uses rollers is dangerous, because it is so easy for the operator to get his hand in between the rolls. Generally the distance between the rolls varies according to the work going through them, and this fact in itself makes the problem of protection very difficult.



The drawing shows a simple scheme that has saved many a hand and finger. The two guards not only act as guards but guides as well; they are pivoted on studs, and open or close to suit the thickness of the stock being rolled. The bottom guard is held in an upright position by means of a spring, one end of which is fastened to the guard, while the other is fastened to the body of the machine. Both guards are provided with lugs, on one or both ends, which bear against some part of the machine, and prevent them from coming into contact with the rollers.—J. H. Moore, Toronto, Can.

Cutting Sheet Metal with a Handsaw

A simple method of cutting sheet-metal roofing with a handsaw without injury to the latter can be used by carpenters and

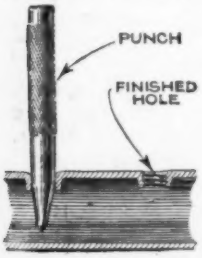


A Simple Method of Cutting Sheet Metal, in the Absence of Snips, with an Ordinary Handsaw: The Saw Cuts Cleanly and Quickly, and is Not Injured by the Process

others if a pair of snips is not available. Two planks are supported by horses at each end. A space just wide enough to permit insertion of the saw blade, is left between the planks. To cut the sheet metal, it is laid on the planks, the line along which the cut is to be made being directly over the space between the boards. The back edge of the saw is placed in the space, against the end of the metal. A piece of two by four is then placed against the underside of the planks and the toothed edge of the saw, as shown in the upper drawing. With the saw held in this manner, a backward pull on the handle starts the cut. This operation is repeated until the sheet has been cut across.—Irl R. Hicks, Centralia, Mo.

Tapped Holes in Thin Tubing

In making an overhead irrigation sprinkler, some of the pipes were found too thin to hold threads into which the sprinkler jets could be screwed. The difficulty was overcome by using a center punch to make the holes, and to pull the metal into a long neck, which could then readily be tapped. In this manner the whole of the thin-walled pipe was made to take the sprinkler jets, without the delay that would have been caused in obtaining heavier pipe.—John Gormly, Norristown, Pa.

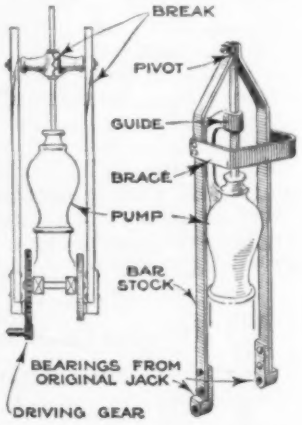


Silent-Chain Sprockets as Belt Pulleys

Small electrical generators for automobile use are almost invariably driven by silent chains running over sprockets. A fact not very generally known is that such a sprocket can be used without alteration to carry a belt when necessary for testing the generator, or even for regular operation on a car in emergency. Many mechanics would suppose that a flat belt would not stay on the sprocket, since it is not crowned like a belt pulley. A test will convince, however, that there is no danger of the belt coming off unless it slips or breaks. The greatest objection to running a belt on a silent-chain sprocket is that it is very hard on the belt and its coupling. The drive should therefore never be used except for a test or when a broken chain, which cannot be immediately replaced, makes the use of the belt necessary.—Curtis Ralston, Chicago, Ill.

Repairing Pump Jack for Engine Drive

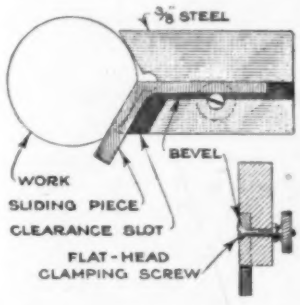
A deep-well pump was fitted with a jack geared to a 1½-hp. engine, pumping water through a 1¼-in. pipe against a 200-ft. head. The jack was of the ordinary commercial type, consisting of a cast-iron yoke through which the pump rod fitted and to which it was clamped, and two hardwood arms, drilled with a series of holes and bearing on crankpins on the gears. The yoke broke in the middle, causing the wooden arms to break also, but without damaging the pump rod, guide, or the cast-iron bearing boxes bolted to the lower ends of the wooden members. As it was thought that a new yoke of the same pattern would soon break also, a new rib consisting of two arms of 1½ by ½-in. iron was made. The upper ends were bent inward to meet the pump rod, and were bolted to it with a bolt and locknuts, thus eliminating the yoke. The original cast-iron boxes were bolted to the lower ends of the iron arms. When tried out, the arms were found to



bend outward, and to overcome this, an iron brace of ½ by 2-in. stock was bolted across them. As the thrust on the brace was outward, 5/16-in. bolts were found large enough to hold it, although rivets could also have been used. The brace was offset enough to clear the pump-rod guide casting; its corners were forged round instead of square for additional strength.

Gauge for Milling Hexagons

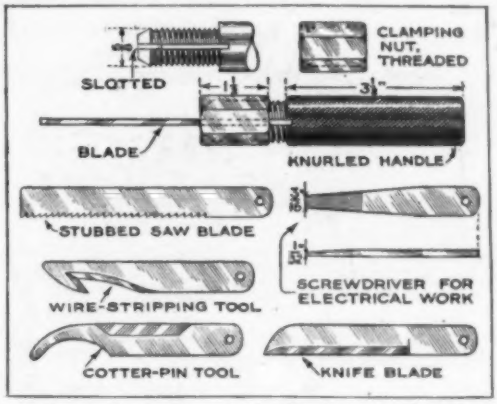
Those who have occasion to mill hexagonal shapes from round stock will find the gauge illustrated a valuable assistant. In order to avoid cutting one side too deeply and thus spoiling the work, it is usual to fall back on the cut-and-try method, whereby it may be necessary to revolve the work in the dividing head several times before a full hexagon is cut. The depth of cut can also, of course, be figured out, but this method is avoided by many on account of the liability of errors creeping into the calculation. The body of the gauge is ⅜ in. thick, with the end cut to a "V" of 120°, included angle, the center of which is filed away or a hole drilled to admit light. A slot is cut along the length of the body, one side of the slot being exactly in line with the center of the V. Next, a piece is made to slide in the slot with a 30° angle on the end, the angular portion fitting a clearance slot cut in the body. A slight bevel is filed on one side of the sliding piece, and a flat-head screw and knurled nut, used as shown, complete the device. To prevent the screw from turning when the nut is tightened, a flat is filed on the underside of the head, to fit against the bevel on the sliding piece.



To use the gauge, the sliding piece is pushed forward until the corner is in line with the edge of the shaft, as shown. The nut is then tightened, and a line is scribed on the work along the angular part of the sliding piece. This line is then clearly defined with punch marks, and the cutter set to split these in two. The work can then be milled to this depth on six sides, and a perfect hexagon, for the size of stock used, will result.

Handy Combination Tool

A handy combination tool that will find many uses in the hands of the automotive repairman or in the repair shop, is easily

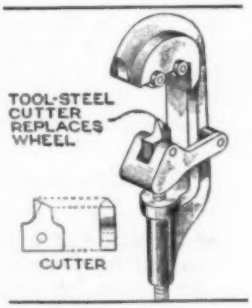


A Handy Toolholder and Outfit of Tools, Made from Pieces of Hacksaw Blades, That will Find Many Uses in the Hands of the Repairman and Auto Owner

made from a piece of round steel, about ⅞ in. in diameter. One end of the stock is turned, threaded, the end beveled, and slotted to take the tools. A nut, with an interior bevel corresponding to that on the screw, is provided to screw over the threaded portion of the holder, so that, when in place and screwed tight, the tools will be firmly held. A set of tools for use in a holder of the type described may easily be made from pieces of hacksaw blades, a few suggestions being shown in the drawing. These, and others that will suggest themselves, can easily be shaped on a grinding wheel.

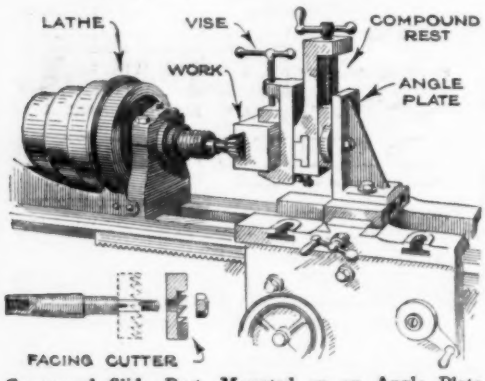
Improving the Pipe Cutter

A boiler maker found that boiler tubes cut off at the ends with the revolving-wheel type of pipe cutter cracked when the bead was being turned over. To overcome this difficulty, the movable wheel was removed, and for it a cutter similar to a lathe tool was substituted, with results that were entirely satisfactory. The cutter need not be turned down against the work so hard as is the case when the wheel cutter is used.—Irwin T. Fox, Richmond, Ind.



Lathe Used as Milling Machine

With the simple addition of a vertical feed to raise and lower the work, a lathe makes a first-class milling machine. There are various attachments manufactured for this purpose, but all that is necessary



Compound Slide Rest, Mounted on an Angle Plate, Converts the Lathe into a Milling Machine. The Work is Held in a Tool Vise, and Standard Milling Cutters are Mounted on a Taper-Turned Arbor, Fitting into Headstock Spindle

for a small lathe is an angle plate to change the compound slide from the horizontal to the perpendicular. This angle plate, faced on both sides, has holes drilled in it to match the circular groove in the compound swivel. The toolpost slot may be used to hold the work by tapping the casting to receive setscrews. A small tool vise can be clamped to the toolrest, or if a clamping table is preferred, it may be used in the same manner. The attachment is universal, as the plate may be swiveled on the carriage or the compound slide may be swiveled on the plate, to give any desired angle. The cutters are carried on a taper-turned arbor, fitting the lathe spindle. If heavy cutting is to be done, this arbor should be tapped to receive a long stud, passing through the headstock spindle, whereby the arbor can be drawn up tightly. Standard facing, side, or end-milling cutters may be used.—Edwin J. Bachman, Fullerton, Pa.

Creosoted-Wood Silos

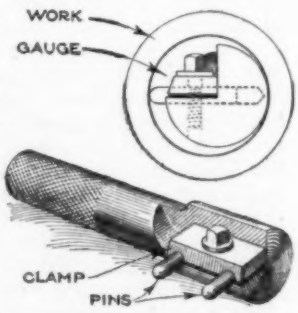
Wood-preservation studies have shown that the value of wood silos can be greatly increased by proper treatment with coal-tar creosote. A good creosote treatment will not only increase the durability of the wood, but will reduce the tendency of the staves to shrink when the silo is empty. A creosoted silo cannot be painted afterward; however, it does not need painting, for the creosote protects the wood, and its color is very pleasing. Highly durable woods, such as heart cypress or redwood, do not need protection against decay so much as the nondurable woods, but a thorough creosote treatment will make the nondurable woods, such as sap pine, last longer than durable species will without treatment.

Contamination of the silage by creosote from the staves need not be feared. This is borne out by experiments and inquiry among the many farmers who have used creosoted silos. In order to be quite sure, it is well to allow the creosoted staves, or the finished silo, to stand a few weeks before filling.

The most thorough creosote treatment can be given by pressure methods. If pressure-treated wood is not available, very good results will be obtained by the hot and cold-bath treatment. If a good penetration of coal-tar creosote is obtained by either of these processes, it is not too much to expect the silo staves to resist decay for from 25 to 30 years.

A Simple Internal Gauge

When used on collars or other work of short length, the adjustable internal gauge illustrated will easily take the place of a number of solid plug gauges. The minimum diameter of the one shown is 1 in., this being the size to which the head is finished. Two $\frac{3}{16}$-in. holes are first drilled and reamed in the side to take round-ended pins. Next, a quadrant is milled out as shown, and a clamping plate, with two grooves to fit over the pins, is made. A hole is drilled and tapped in the gauge, between the two pin holes, and a square-headed collar screw, that passes through a hole in the clamp, completes the assembly. The first pin is used for the low-limit setting, and the second for the high, the pins being set by measuring over all with a micrometer. When setting, it is convenient to have the clamp tightened on the pins just enough to hold them in place; then the micrometer can be brought down to the size required, pushing the pin in at the same time.

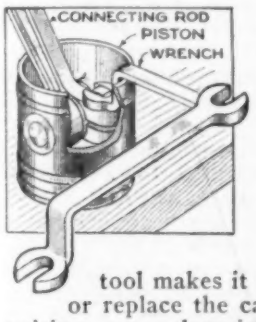


Veterinary Capsules for Small Parts

Empty veterinary capsules make excellent receptacles for holding very small parts and pieces in such a manner that the quantity and condition of the contents can be told at any time, as the capsules are transparent, and, unlike glass, practically unbreakable. Used in series, the capsules, which can be obtained in different sizes, can be used to hold beads, paint or bronze colors, pins, tiny buttons, small screws, graphite, or leads. These capsules, being made of gelatin, must not be allowed to become wet. A simple rack for holding such receptacles in either a horizontal or perpendicular position can easily be made.—C. Nye, New York City.

Connecting-Rod Wrench

An offset made on the end of an open-end wrench, as shown in the drawing, will be found of service in removing the capscrew from the wristpin-end of connecting rods.



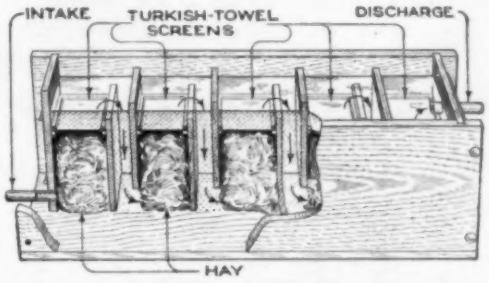
The wrench is bent in such a way that the handle will clear the piston skirt. Working with the hands alone, this tool makes it possible to take out or replace the capscrew without requiring any clamping arrangement to prevent the piston from turning.

A Feed-Water Filter

A rather novel filter, made from Turkish towels and marsh hay, was used in connection with the Dayton river-channel improvement work, for removing sediment from the river water in order to have available at all times an adequate supply of clear water for the steamboat boilers.

The construction of the filter is clearly shown in the drawing. It consists primarily of a long rectangular wooden tank, divided into compartments by partitions, through which the feed water is caused to circulate, entering at one end and leaving at the other and passing through consecutive filters of hay and toweling in the course of its journey. The water enters, yellow or brown with unsettled river mud, and leaves ready to enter the boilers, clear enough to drink.

Five compartments are shown in the drawing, but a greater or smaller number may be used, depending on the amount of sediment to be removed. The compartments are separated by double baffle boards set about 3 in. apart, the water



A Simple Filter for Removing Mud from River Water, to Provide Clear Water for Steamboat Boilers, Uses Hay and Turkish Toweling as Filtering Materials

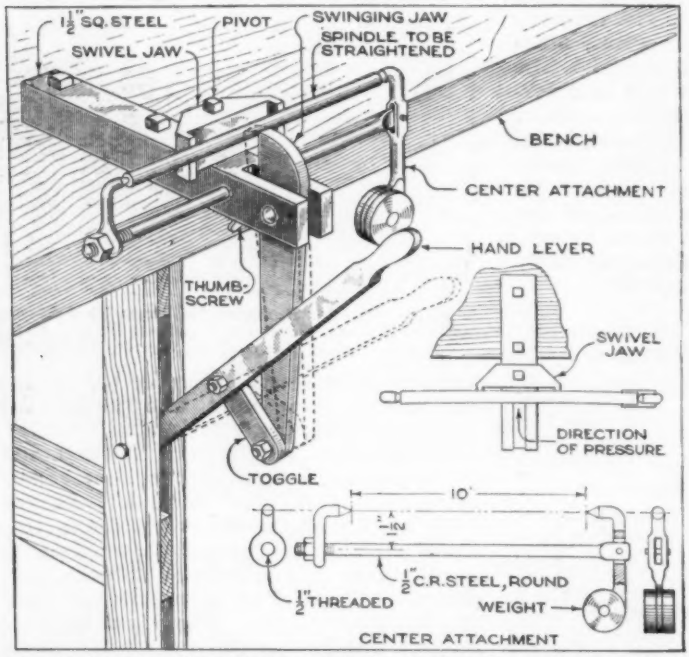
passing, in all cases, over the top of the one nearest the inlet and under the bottom of the next, thus always entering a compartment at the bottom and passing upward through the filter. Each compartment is filled with hay to the level of the cross cleats near the top. Finer screens, made by tacking Turkish toweling onto rectangular frames, are placed on top of the hay and held in place by the cross cleats. The water passing through the compartments, always in an upward direction, leaves its burden of sediment in the hay and under the toweling, thus preventing the rapid clogging of the filter which would result if the water passed downward. With this arrangement, it was necessary to clean the filter only twice a week—a very simple operation, consisting in removing the towels, washing them with a hose and replacing them. It was not found necessary to remove the hay except at long intervals. The simplicity and efficiency of the device, which can easily be built by any carpenter, adapt it to many different situations. It must be remembered, however, that it is for sediment only; lime and other soluble ingredients are, of course, not removed.—Ivan E. Houk, City Engineer, Dayton, Ohio.

Painting on Old Walls

Old walls, especially of kitchens, have a thin layer of grease and smoke upon them that may not be perceptible, but which will prevent paint from adhering properly. Before being repainted, they should be washed thoroughly with soap and water, to which a little ammonia may be added, and finally rinsed with water.

Spindle-Straightening Fixture

Often, in the course of the manufacture of articles of standard design, small shafts or spindles are used; these are usually made from a good grade of tool steel, centered and turned to the form required. After centering a great quantity of such spindles on small turret lathes, it was found, after they had been cut off, that quite a few had been cut from stock that had been slightly bent, and while they would run fairly well at the ends, due to close chucking, the center would run out so badly that they would not clean up on the machining cuts. It was decided that the common method of straightening the stock would be too slow and unprofitable, and the fixture shown in the drawing was made. The body of the device is made of square steel and is bolted to a bench so that the slotted end projects over the edge. A ½-in. slot, cut in one end, receives a movable swinging jaw. Mounted on the top side of the base is a swivel jaw having two extending lugs, the metal between them having been removed on a shaper; this block is fastened loosely to the base by a ⅝-in. capscrew. A ½-in. hole is drilled and reamed horizontally through the iron base, just behind the slot, to take the centering attachment upon which the work to be straightened is supported.



For Straightening Light Shafts or Spindles, in Quantity, a Fixture of This Type Has Much to Commend It. The Centers Holding the Work Are Adjustable Horizontally So That Any Part of the Work can be Reached

The centering attachment is made from a piece of steel rod, which is flattened at one end and threaded at the other. On the threaded end is screwed a stationary center, which is held tightly by a locknut. A swinging center is pivoted to the flat end of the rod, thus permitting quick positioning of the work between the centers. Also, the weighted end of the swinging center keeps it pressed against the end of the work, and keeps the centering fixture normally in a vertical position.

When the operator has placed a spindle between the centers, he will first revolve it with his fingers, and, by sighting, detect the point at which the work runs out. He now brings the high spot toward himself and by pressing down on the toggle handle, exerts pressure against the work, bending it in the opposite direction. The work is again tested, and the operation repeated as may be necessary.

Stripping Films from Cracked Negatives

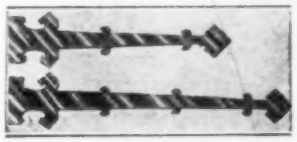
To strip the film from cracked glass photographic negatives, so that the film can be placed on another piece of glass and prints made from it in the regular manner, the film is first hardened in a three-per-cent solution of chrome alum, washed for five minutes, and then dried. Next, a 20-per-cent solution of white gelatin is made and filtered while hot. A liberal quantity of this is poured over the negative, which has previously been warmed and placed as level as possible. When the gelatin has hardened, the negative is again placed in the chrome-alum solution, washed for five minutes, and placed in denatured alcohol for a half hour, after which it is dried again.

To strip the negative from the glass, use a mixture of 2 oz. water, 1 oz. denatured alcohol, and 1 dr. of commercial hydrofluoric acid. After a few minutes' immersion in this bath the film can be

loosened around the edges with a small stick of wood, cut to a chisel point. When this stage is reached, the negative is transferred to a tray of clean water for a minute or two and then to another; the actual stripping is done in the latter tray, by means of the stick. After removing the film, it is washed in two or three changes of clean water, then laid out smoothly on a ferrotype plate to dry. The fingers should not be allowed to touch the hydrofluoric-acid solution, which is very corrosive and poisonous. Usually it is not advisable to place the film on glass, as there is considerable risk of distortion in drying, but, if necessary, it can be done. A good method is to fix out an unexposed plate, and harden in formalin the layer of clean gelatin left. This is slipped underneath the stripped film while the latter is lying in water. The plate is then raised until the film rests on the glass securely. Finally, it is drained and allowed to dry in contact with the gelatin.

Cutting Torch Produces Ornamental Ironwork

What can be done in the way of producing ornamental hinges from sheet metal with an oxy-acetylene cutting torch is clearly shown in the photograph. The intense heat developed makes it possible to cut the metal as easily as wood is cut with a band saw. Practically any metal can be worked by this means, the hinges shown having been cut from bronze.—Harold C. Ridgely, New York City.

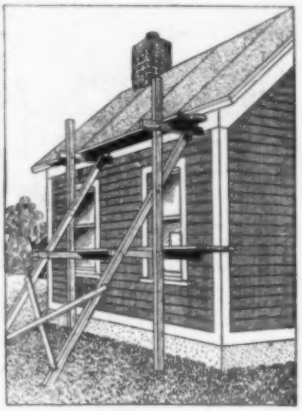


Balancing Polishing Wheels

It is highly important that polishing wheels be in balance. Balancing ways are made for this special purpose, and the balancing itself is usually done by nailing pieces of sheet lead on the light side of the wheel, until the wheel remains at rest in any position on the ways. It is also important that the wheel run absolutely true. The wheel is not necessarily true, however, even if in balance. By the use of an old file or buff stick, supported by a temporary rest, the wheel can be made to run so that every portion of its circumference will come in contact with the work.

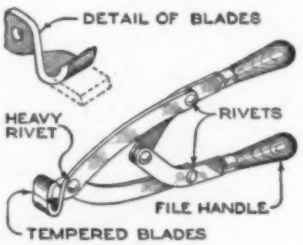
Scaffold That need Not be Fastened to Building

When reshingling or repairing a building, it is quite necessary to have a scaffold to work from, as a ladder does not give the proper freedom of movement or stability for the worker, and, unlike new construction, it is not usually possible to nail blocking to the sides of the house for supports. The drawing shows how a scaffold can be erected without marring the surface of the building, and yet be substantial enough for all work. A piece of 2 by 4 or 2 by 6-in. stuff is placed at an angle to the building, and as close up under the eaves as possible, as this saves side bracing. Another piece is placed in a vertical position, and crossing the first, and the two are spiked together where they cross. This is done at each end of the building, and in the middle if necessary; then short pieces of similar lumber are nailed across the long pieces to form supports for the staging.



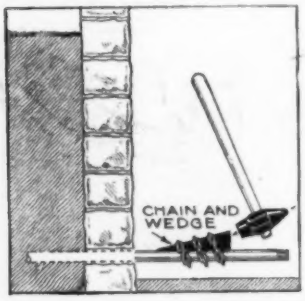
A Small Bolt Cutter

Sawing off the ends of bolts is slow and tedious work, and it is not always possible to use the hacksaw, because space is lacking. The drawing shows a clipper that can be made from two flat files, the arrangement being such that a powerful leverage is obtained. Four 12-in. files are used, their ends being annealed so that they may be drilled and the cutting lips forged. When assembled with bolts or rivets, two ordinary file handles are fitted to the tangs of the files forming the handles. The cutting edges should be tempered to the same hardness as that generally used for lathe tools, that is, to a light-yellow color.



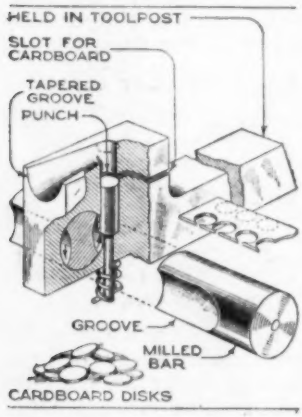
Driving Pipe Underground

It is often possible, when laying iron pipe of small diameter, to drive the pipe through the earth and save the cost and trouble of digging a trench, with the aid of a specially constructed point, something after the style of a well point. One trouble that is common to this method is that the outer end of the pipe must be protected against the blows of the hammer or maul used. Wooden blocks offer slight protection and damage to the threads is likely to result in spite of them. A much better method is to use a steel wedge secured to the pipe by a length of chain in the manner shown. The blows of the hammer on the wedge tighten the chain and afford sufficient grip, and the heaviest blow will not damage the pipe.



Punching in the Lathe

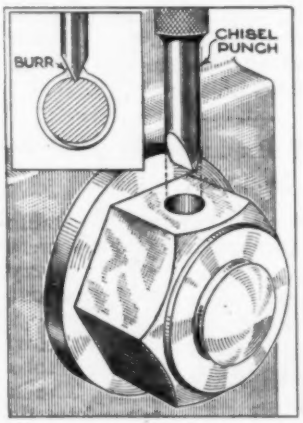
The drawing shows a rather novel fixture used for cutting cardboard disks in a lathe. There are three main parts, the punchholder, punch, and operating shaft. The holder is made of any convenient size, to the shape shown, the back end fitting in the toolpost. Near the front, a hole is bored to take the milled bar that operates the punch, and tangent to this hole a small hole is drilled from top to bottom. This is counterbored, the size of the punch to be used, down to the center of the larger hole, and a tapered groove is milled from the counterbore to the front of the holder, on the top face. The punch is made to fit the counterbored hole, as shown, and fitted with a coil spring, washer, and pin, to keep it down on its seat. A narrow slot is cut in the top of the holder, in the position shown, to take the cardboard from which the disks are cut. The operating shaft is a bar, centered at both ends and having semicircular grooves milled on opposite sides.



In use, the holder is gripped in the toolpost, with the shaft held between centers and driven by a dog. The lathe is run backward, and the stock fed by hand; at each revolution the punch cuts two disks, which are forced out of the hole, and slide down the tapered groove into a box.

A Simple Locknut

The drawing shows one of the simplest forms of locknut, that will stay in place without loosening until forcibly removed with a wrench. A 3/16-in. or larger hole, the size varying with the size of the nut used, is drilled through the side of the nut. After the nut has been tightened, a nick is cut across the bolt thread, using a small chisel punch as shown. The hole serves a double purpose, as it permits insertion of the punch and forms a cavity for the upraised burr, which prevents the nut from turning. Naturally, to be the most effective, the cutting edge of the chisel should be held parallel to the axis of the bolt when raising the burrs.



Grinding Troubles

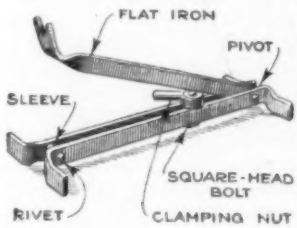
If the wheel glazes, the work is burned or the wheel cuts slowly, the remedies are, for the first, to use a coarser wheel; for the second, to use a softer wheel, and for the last, to decrease the table speed or increase the feed. If the wheel wears too fast, increase the table speed or decrease the feed; if this has no effect, try either a harder or a finer wheel. For a finish that is too rough use a finer wheel, or, in some cases, an elastic wheel; or, these remedies failing, try a little cutting oil in the grinding solution, if only soda water is being used.

Formula for Breaking Strength of Rope

For three-strand Manila rope with a regular lay, and from ½ to 4½ in. in diameter, the following computation will give the strength of the cordage: The average breaking strength in pounds equals 5,000 multiplied by the diameter of the rope in inches, and the product then multiplied by the diameter in inches increased by one. Thus, in calculating the strength of a 3-in. rope, multiply 5,000 by 3, the diameter in inches, and then multiply the product by 4, which is the diameter of the rope increased by one, the total product being 60,000 lb. This method gives the average maximum weight that the rope will hold, but the working load must, of course, be much less.

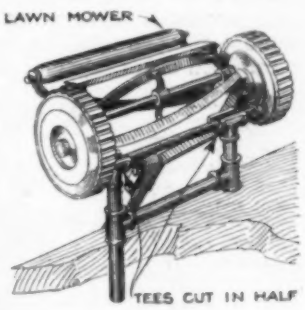
Adjustable Stock Support

For a small shop, the handy stock support illustrated will be found much more useful than the usual telescopic arrangement, since it can be used to support bars very close to the floor, as in fitting a shaft to the finished machine, or high up for pipe-threading machines and work in the vise. It is made of ¾ by 1½-in. flat stock. Two pieces of stock form the base. These should first of all be dropped at the ends enough to clear a bolt head, then bent at right angles to form feet. The lever support is twisted at right angles at one end, bent upward a little, and a "V" cut. The opposite end is drilled for the pin on which it pivots, and which, being riveted at both ends, binds the three pieces together; a similar pin, with a sleeve, is used at the other end. An ordinary square-headed ¾-in. bolt slides between the two members forming the base, the top of the square on the bolt being filed a little on the sides to allow it to enter the channel and prevent it from turning. A special clamping nut is shown, which, of course, is convenient, but an ordinary nut will serve the purpose if the cost is to be considered. Made to a length of about 3 ft., this support has a range from that height to 6 in. from the floor. The bars held in this support must be fed or pulled forward so that the pressure is kept on the bolt, that is, away from the pivot.



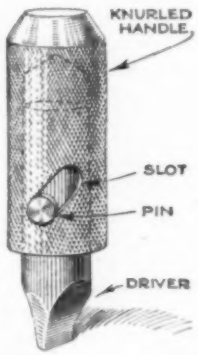
Fixture for Lawn-Mower Repairs

The drawing shows a fixture that has been in use for several years in a shop making a specialty of lawn-mower repairs. It is made from short lengths of pipe and suitable fittings. The distance between the two half-tees is such that a lawn mower of any width can be placed in the fixture and held firmly. The projecting pipe ends of the fixture fit into holes drilled near the edge of the workbench, so that it can be removed when not in use. The lawn mower is supported in the fixture by the stay rod, as shown, with the handle resting on the floor.—A. W. Zimmerman, Chicago, Ill.



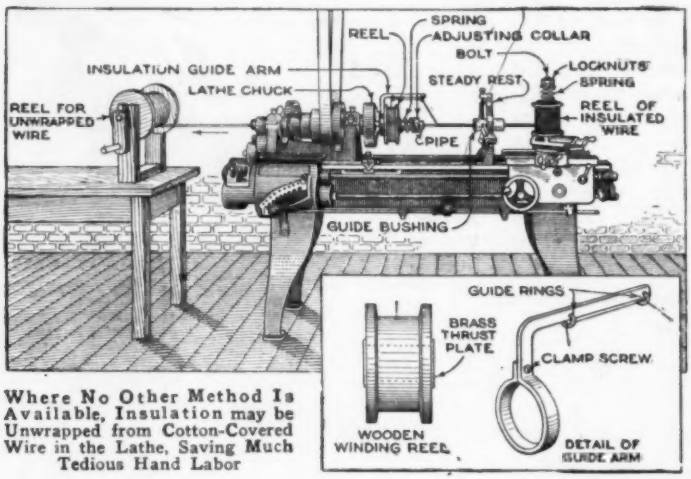
Removing Tight Screws

Screws of the slotted-head variety are, at times, very difficult to loosen, especially if they have remained undisturbed for a long time in a damp place. The little tool shown in the drawing will aid in loosening such screws without destroying the slot, as any attempt to hammer them off will do, thus making the job more difficult. A short piece of ⅞-in. stock is drilled up the center with a 9/16-in. drill, knurled on the outside, and an angular slot, ⅜ in. wide, and running into the 9/16-in. hole, is cut in the side. The driver is made of 9/16-in. tool steel, drilled for a ⅜-in. pin, which is driven in when the two parts are assembled. With the pin at the bottom of the angular slot, the tool is grasped firmly in one hand and placed in the screw slot. The top is then lightly tapped with a hammer, which, while keeping the blade in the slot, at the same time continually presses it round in a left-hand direction, so as to loosen the screw. Only light taps of the hammer should be used, as heavier blows will not produce the desired effect.



Unwrapping Wire in the Lathe

THERE are occasions when it is necessary to remove the insulation from magnet or annunciator wire, as when triple-covered wire is to be reduced to double, to save winding space, or when the paraffined outer layer of annunciator wire is to be removed to convert it into single cotton-covered magnet wire. This is an extremely tedious operation when done by hand, particularly when the wire is of any length.



Where No Other Method Is Available, Insulation may be Unwrapped from Cotton-Covered Wire in the Lathe, Saving Much Tedious Hand Labor

The drawing illustrates a lathe set-up designed to unwrap the insulation mechanically. The insulated wire is carried on a reel, or spool, held on a bolt clamped to the compound rest. A metal thrust washer, a spring, and two locknuts on the end of the bolt, hold the spool by friction and prevent it from being too easily turned. The wire is carried along above the lathe bed through a sleeve held in the steady rest and through the headstock spindle to another spool, arranged with wooden bearings and a hand crank, and mounted on a bench or stand beyond the lathe. A piece of brass or iron pipe is held in the universal lathe chuck; fastened over the chuck jaws is a clamp made of bar iron having its end turned over at right angles, to form a guide for the insulation stripped from the wire, two guide rings being provided for this purpose. Next, a brass thrust washer or plate is placed on the pipe, and then a hardwood spool, upon which the insulation is wound as it is unwrapped from the wire. Another thrust washer is placed in front of the spool, then a compression spring and an adjustable collar to hold it in place.

In use, enough of the wire is stripped by hand to allow the unwrapped portion to be passed through the spindle and attached to the spool at the rear, and the cotton threads are carried through the guide arm and attached to the spool on the tube, the spring being so adjusted as to allow the spool to turn stiffly, yet without pulling the wire badly out of line or breaking the strands. It can be seen that, as the wire is drawn along, the insulation will unwind from it, pass through the guides on the rotating arm and wind itself on the spool. As the rate of winding on the spool will be much less than that at which the strand is unwound from the wire, there will be considerable slippage between the spool, thrust washers, and tube, the spool being pulled around by the insulation. The success of the operation will depend upon the spring adjustment and the rate at which the wire is drawn along. An adjustment that is too loose will prevent the winding of the insulation upon the spool, while one that is too tight will pull the wire out of alinement and possibly break the strand being unwound.

By reversing the process, it is possible to wrap bare wire, but a smooth job would hardly result. For special purposes, however, such as wrapping thermocouple resistance wires with asbestos string, the method should be successful.

For a short lead, the end of the wire could be attached to a bolt clamped to the tool block in place of the spool; then the carriage would be started moving toward the end of the bed, drawing the wire through the headstock spindle and at the same time applying the wrapping. Here a good deal would depend upon giving the carriage the proper rate of feed. Two, three, or more, layers of insulation could be wrapped or unwrapped, but only one at a time, the wire being run back and started through each time another layer was to be worked upon.

¶ To drill horizontal holes accurately with a ratchet drill, make the punch mark deep, and apply sufficient pressure to the drill to prevent its tendency to slip down.

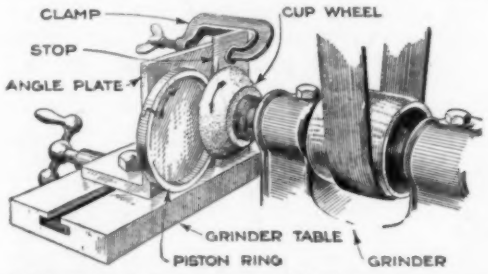
Extension for Cold Chisel

There are times when the only method to loosen a nut with the tools at hand is to set a chisel against one of the corners and strike it with a hammer. However, sometimes nuts are so located that the chisel is not long enough to reach them. In such cases, an extension can easily be made for the chisel by driving a sleeve, of pipe or tubing, over the head of the chisel, and inserting a piece of rod, the size of the chisel shank, into the upper end of the sleeve.

Grinding Piston Rings

In the small jobbing shop there is often a call for special piston rings to fit odd-sized bores of steam and gas-engine cylinders. To get an accurate fit in the ring groove, the sides of the ring must be ground or filed off; this usually difficult job can readily be done on the shop's universal tool grinder.

An angle plate is mounted on the table of the grinder, parallel with the face of a cup wheel, as illustrated. A piece of flat steel is clamped against the angle plate and serves as a stop, against which the outer surface of the ring rotates. The

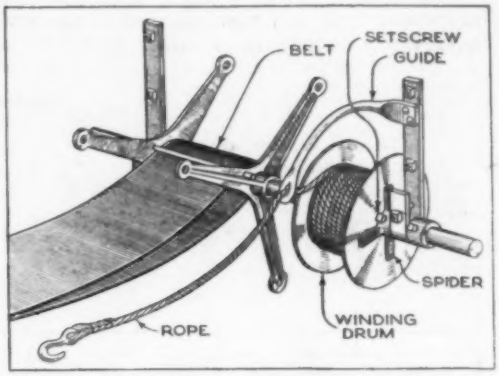


A Simple Method of Grinding Odd-Sized Piston Rings to the Proper Width on a Universal Tool Grinder Solves Another of the Problems of the Jobbing-Shop Mechanic

ring rests and revolves on the table slide. When the rings are cut off the ring "pot" on the lathe, one side is faced carefully and made straight and true. This face is then brought against the vertical face of the angle plate, with the opposite face against the grinding wheel. Rotation of the ring is effected by slowly turning by hand, the wheel producing a pulling effect on the ring in a downward direction. When one side is finished smoothly, the ring is reversed and the opposite side touched up and ground to the exact width of the groove, less about .0015 in. This trick can be applied to many other similar jobs, and, with a little care, good work is easily done.

Winding the Thresher Belt by Power

One of the hard jobs of the thresherman is the winding up of his long drive belt, and a device that reduces the manual



A Simple Attachment for the Grain Separator That Lightens the Labor of the Thresherman by Winding His Long Drive Belt on a Reel—the Tractor Does the Heavy Work

effort required to do this will be appreciated generally.

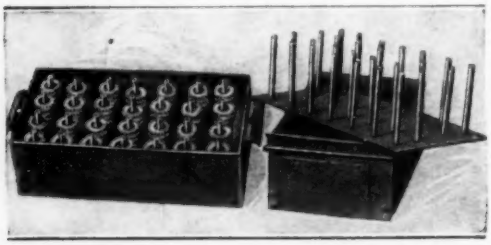
The arrangement shown in the drawing made it possible for one farmer to use power for the purpose of winding the belt on the reel usually provided for that purpose. A winding drum was made from a section of a maple log and fitted with two 20-in. sheet-metal flanges. This drum was fastened to the shaft on which the reel was fitted by a spider, which was originally the hub from the fan of an old separator. A 60-ft. length of ½-in. rope, with a loop at one end and a hook at the other, was then prepared. The looped end of the rope was dropped over a pin driven into the face of the drum, so that when the rope had been unwound, it would slip off. An arm, with a hole in the lower end, was attached to the frame of the separator to act as a guide for the rope when rewinding.

To operate the device, the tractor is driven to the separator as for hitching, but only the hook on the rope is attached to the drawbar. The belt is then fastened to the reel and the tractor is driven away. The pull on the rope wound around the drum serves to wind the belt in its place. When the belt is to be unwound again, the rope is attached to the drum and thus, as the belt reels off, the rope is wound up for repeated service.

¶Mercury boils at 676° F., and at that and higher temperatures it vaporizes rapidly, though mercurial vapors will rise from the metal at a lower temperature.

Rack for Steel Stock Boxes

Every factory uses standard steel stock or "tote" boxes, to carry from one operation to another materials and parts being worked upon in the shops. Usually, there are many different kinds and sizes of parts that must be accommodated, and with a variety of production, it is not advisable



A Rack for Steel Stock Boxes That Makes Possible Rapid Counting of the Parts, and Also Prevents Them from being Damaged

to equip the stock boxes to handle only one particular piece permanently. Flexibility must be secured, and this is accomplished by a large manufacturer of lighting plants as illustrated.

A steel plate, ¼ in. thick, is cut enough smaller than the inside dimensions of the steel box so that it will drop in easily. It is drilled with a suitable number of holes, depending upon the number of spindles that is desired in the box. This number will depend on the size of the parts to be placed on the spindles and the clearance necessary between the parts. Enough space should be left between the spindles so that a variety of objects of approximately the same size can be accommodated, without danger of rubbing or damage. The spindles may be iron pipe, of any suitable size, although ⅜-in. pipe usually provides sufficient strength. They should be threaded for about ⅝ in. on one end, and the holes in the plate tapped to suit. After the spindles are screwed into the plate, a pair of thin locknuts are screwed on the projecting ends of the spindles and lightly riveted over. This provides a strong, sturdy, adaptable rack that can easily be placed in an empty box. It also allows quick counting, as anyone can tell at a glance if all the spindles are full and how many parts are missing.—Edward H. Tingley, Dayton, Ohio.

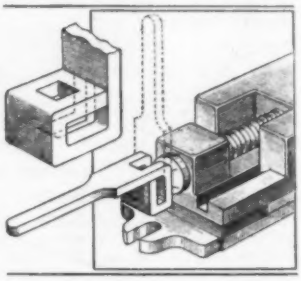
¶An arrow cut on the feed pawl of a shaper will save time and confusion, by indicating the direction in which the machine will feed for each position of the pawl.

Finishing Wooden Patterns

In making wooden patterns, the most tedious part of the work is the sandpapering between the several coats of shellac, and, also, applying the beeswax fillet. Little or no sandpapering need be done, yet a high gloss with but one coat of shellac obtained, if the pattern is first completely covered with melted beeswax. This may be applied with a hot iron held against a cake of the wax, which, as it melts can also be guided into the places to be filleted. Care must be taken not to have the iron so hot as to scorch the glue at the joints. Little wooden chisels and round-end tools are used to scrape off the surplus wax and to groove out the fillets, the wax chips being kept brushed away with a small brush. One coat of the varnish will dry with a high gloss, and the pattern will be entirely moisture-proof and ready for the foundry. This method will be found particularly useful with patterns of irregular contour.

Combination Box and End Wrench

A novel and cheaply made wrench, designed for saving time when used on a milling-machine vise, does the work of an open-end wrench and a box wrench. All operators of milling machines know that when the vise is bolted to the table, with the jaws at right angles to the travel of the table, the regular wrench can only be given half a turn at a time, when opening or closing the vise, as it strikes the table. To save a little time some use an open-end wrench to bring the jaws up to the work. If special jaws are being used on irregular work, the vise may require several turns of the screw to open or close it.



The wrench illustrated is made from 7/16 by 1⅛-in. stock, forged into the shape shown. The bent-back portion has a square hole in it to fit the square of the vise screw. The front and adjacent side are also slotted to fit the square. The remainder of the stock is finished as desired, to form a handle grip.

When opening or closing the vise, the wrench is used as shown by the solid lines, but when greater pressure is re-

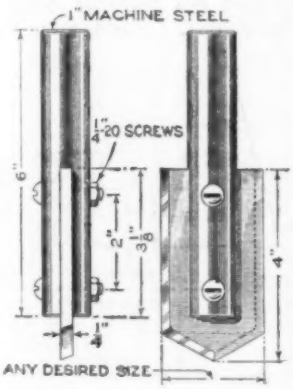
quired to loosen or tighten, the wrench is slipped back until the square hole is off the square on the vise handle; it is then swung around and pushed down until the end of the slot rests on the vise-handle square, and the handle of the wrench is in a perpendicular position, as indicated by the dotted lines. The wrench is then used as an open-end wrench.

Writing White on Blueprints

White ink, water color, or a strong solution of baking soda, are generally used for writing on blueprints when extra details are to be added and it is not desirable to make new prints from the corrected tracing. A fine permanent white line may be made by dissolving a small lump of unslaked lime in water and using this liquid as one would ink. The lime water does not work like whitewash, but, like baking soda, acts on the blue ground chemically.

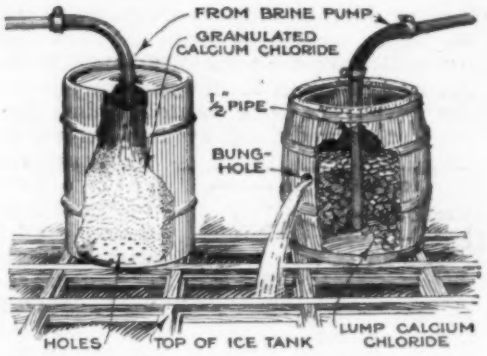
Drill for Slate or Marble

Tile setters, plumbers, electricians, and others must frequently drill holes through hard, brittle tile, porcelain, or slate at no slight expenditure of time and broken drills. The drawing illustrates a drill for such work that is particularly effective for use when large holes are to be drilled. The cutting tools, which are made of tool steel, are removable for sharpening, and can be made for holes of different diameters. The edges are milled off at an angle of about 45°, or enough for good clearance, and the lips are sharpened in about the same manner as an ordinary flat drill, the sides also being sharpened. When a hole is to be drilled with this type of tool, a guide hole is necessary to allow the dust to fall through. Very slow speeds are essential to successful drilling in slate, marble, and similar materials. The drills will not work as well at high speed as at slow speed because of the excessive friction.—Arthur F. Cox, Chicago, Ill.



Dissolving Calcium Chloride

When mixing the brine solution for refrigeration plants, calcium chloride is dissolved in water, and many hours of back-breaking work can be saved if the machinery of the plant is made to do the work mechanically. The usual method of mixing the solution is to stir the chemical in a tub or barrel until dissolved and then dump it into the tank, and repeat.



Methods of Dissolving Granular or Lump Calcium, One of the Chemicals Used in the Brine Solutions of Refrigerating Installations, without Manual Labor, the Brine-Circulating Equipment Doing the Work

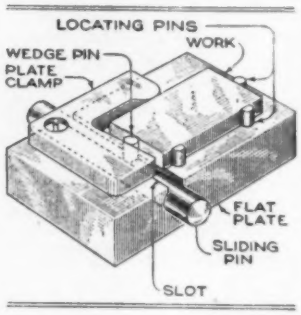
The drawing shows two systems, depending upon whether the granular or lump chemical is used. If the calcium chloride is granular, punch a number of holes through the bottom of the drum with a chisel and cut an opening in the head large enough for the insertion of a hose. Then roll the drum over on the tank top, remove about six ice cans, and set it up over the opening. Connect with the brine-circulating pump, and run the brine or water through the granulated chemical, which will dissolve in a very short time, leaving the drum empty.

When dissolving the chemical in lump form, take a barrel, set it up over the tank in the same way as before, and connect a length of ½-in. pipe to the brine-circulating system; dump in the lump calcium and turn on the brine. The liquid will enter at the bottom of the barrel, and on rising, will pass through the chemical and through the bunghole into the tank below. In this manner the only manual labor connected with the operation is to fill the barrel occasionally with the undissolved chemical.

¶ Engines running under widely fluctuating loads should be provided with a speed-limiting device which acts independent of the governor.

Rapid Jig Clamp

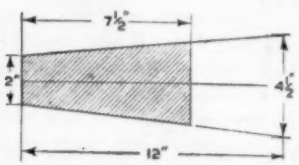
Drilling flat plates of square or rectangular shape is a common shop operation, and simple jigs are, as a rule, used to hold the work, more especially if there are any number of pieces of approximately the same size to be drilled. Such jigs generally take the form of a flat plate fitted with bushings for the necessary holes, the work itself being located against flattened pins and held by two screws at right angles to each other. For work of accurate dimensions, the double-plate clamp shown is much to be preferred to the screws, as the work is gripped or released by a single movement. The clamp is made of flat stock, which should be slightly thinner than the work, cut to the shape shown, and drilled and counterbored for a round-headed screw. Through the side of the jig body a hole is drilled for a sliding pin, which has driven in its center another pin; the latter forming a wedge that slides between the work and the taper side of the clamp. The hole for the sliding pin should be drilled as close to the top as possible and a slot cut through afterward to clear the wedge pin.



In use, the work is laid in place, and the sliding pin is tapped on the end with a light hammer. This forces the wedge pin between the end of the work and the taper of the clamp; this has the effect, as will be seen, of tightening the work from both sides at the same time. A tap on the opposite end of the sliding pin, of course, releases the work.

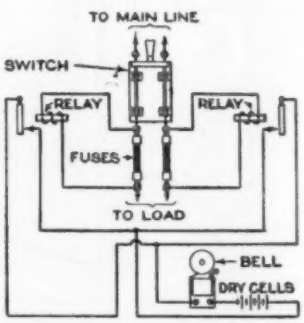
Laying Out Tapered Work

The work required to lay out tapered work by the methods generally used involves considerable calculation, and an easier method will be appreciated by the draftsman. For example, supposing it is desired to lay out a piece to be turned on the lathe, 7½ in. long, 2 in. in diameter at the small end, and with a taper of 2½ in. to the foot. Proceed as follows: Lay out the center line, and mark off, on this line, a distance of 12 in. At one end lay off two points, 1 in. on each side of the center line, and erect a perpendicular joining the two points, thus marking the 2-in. diameter. As the taper is 2½ in. per foot, add 2½ to the diameter of the small end, obtaining 4½ in.; then, at the other end of the 12-in. line, lay off 2¼ in. on each side. Join these points with the points marking the smaller diameter. From the small end, measure 7½ in. along the center line, and at this point draw a vertical line intersecting the two inclined lines. The length of this line, between the inclined lines, will be the required diameter of the large end of the piece.

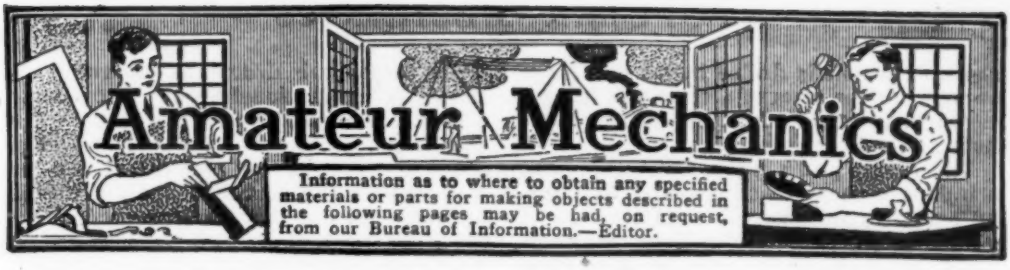


Alarm Circuit for Open Fuses

On electric circuits that supply current to draft fans, electric heaters, water sterilizers, and the like, it is important that an attendant should have instant knowledge of trouble in the circuit. Frequently the attendant's station is at a distant part of the plant, and for this reason the circuit shown in the drawing was devised to give an audible alarm when a fuse blows out. Each fuse is bridged by a relay; this may be of almost any type or size, but should have a resistance of 100 ohms or more. The contacts of the two relays are bridged and connected to an ordinary doorbell and dry battery. If desired, a switch may be cut in on the bell circuit to disconnect it when necessary.



The operation is as follows: Current flows from the main line through the fuses to the load; the relays do not operate, because they are short-circuited by the fuses. Should a fuse go open, the circuit would still be continuous through the relay winding, causing the relay to operate and the alarm to ring. The purpose of the fuse is not defeated, because the resistance of the relay winding will not allow an excessive flow of current.—C. M. Crouch, Minneapolis, Minn.


Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

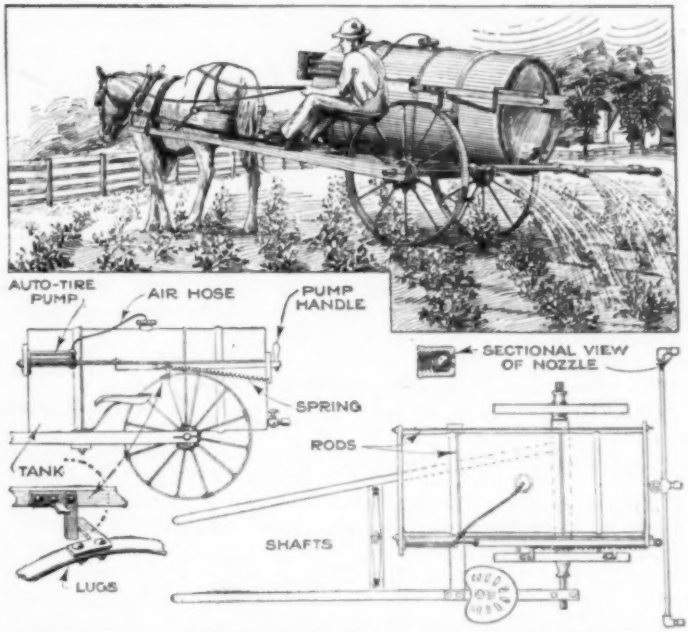
How to Make a Potato-Plant Sprayer

By GEORGE G. McVICKER

WHERE acres of potatoes are threatened with destruction by the potato beetle, it is entirely out of the question to combat the insects by the time-honored method of going along the rows and brushing them into a can, or cracking them between two stones, and spraying must be resorted to if the crop is to be saved. If the area planted with potatoes is small, a hand sprayer may be used, but for a large acreage the work is best done by a horse-drawn sprayer.

The homemade sprayer described in this article is made by mounting a suitable container, which may be a steel oil barrel, an old water tank, or something of a similar character, on wheels, and providing it with a pair of shafts, arranged so that the horse will walk between the rows, the wheels straddling the plants. The shafts are thus arranged by placing one shaft on the outside of one wheel and attaching that on the opposite side at an angle. The container is fastened to the frame by iron rods, bent to fit over the container, and threaded at the ends, which are passed through holes drilled in the frame cross members, then drawn up tight by nuts. To maintain the necessary air pressure in the tank for forcing out the spraying solution, a three-cylinder automobile-tire pump is attached to a piece of plank across the front end of the tank; this is held in place by long bolts passing through a similar plank at the rear. The plunger rod, which is fastened to the piston rod of the pump, is made from ½ by 1-in. flat iron, with one end bent at right angles and a hole drilled through it for the piston rod of the pump. In the opposite end of the rod a hole is drilled, and a handle attached so that the pump can be operated by hand, if desired. This plunger may be made of hardwood.

Four projecting lugs are riveted to the wheel on the pump side of the sprayer. These lugs are so arranged as to engage with a short vertical arm riveted to the plunger rod and push it forward until the lug on the wheel slips off and allows a spring to return the plunger. If it is desired to prevent the pump from working when the device is on the road, the plunger-rod spring can be detached, or the lug on the plunger made as shown in the drawing. To connect the pump to



Spraying Potatoes with a Homemade Sprayer, to Protect the Crop from the Ravages of Its Insect Enemies: Air Pressure for Forcing the Spray through the Nozzles is Obtained by Means of a Tire Pump

the tank, a hole is drilled in the cap, large enough for the stem of a tire valve to pass through, and this is held in place by locknuts and rubber washers.

The piping and nozzles are made from standard pipe and fittings, and the flow of spraying solution is regulated by a globe valve; separate valves may be added to regulate the flow of individual nozzles. The nozzles are made from ordinary pipe caps, in each of which two 1/16-in. holes are drilled at an angle, as shown in the sectional view. In each cap a 5/8-in. brass ball, or a marble of the same size, is placed to make the solution form a spray. A seat for the driver can be mounted on the outboard shaft if this is desired. As the sprayer is jogged about the field, no agitator will be needed, in most cases, to prevent the heavy arsenical poisons commonly used from settling to the bottom.

Brush Removes Refuse from Gutters

When the eaves troughs become filled with leaves, and other litter and refuse, it is quite a task to clean them out. The work is usually done by climbing a ladder and cleaning out the gutter for a few feet, then moving the ladder again and again until the work is complete. A simpler and safer method, since no ladder is required, consists in using the device illustrated. An ordinary brush is attached to one end of a bar of heavy lead or solder, and the opposite end of the bar is fastened to a light pole of the proper length. When this is done, the lead or solder bar is bent so as to allow the brush to sweep the gutter, with the operator standing on the ground. Iron or steel can, of course, be used instead of the lead, if available.

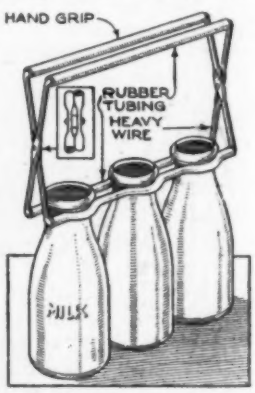
Preventing Discoloration of Prints

Professional photographers rarely, if ever, have trouble with brown spots appearing on the prints in the fixing bath, because the prints are carried into the hypo solution free from developer. This is done by the use of an acetic-acid "check" or "stop" solution, in which the prints are immersed when they are removed from the developer, and before placing them into the hypo. This solution is made by adding commercial acetic acid to clean water, the proportions being immaterial except that enough acid should be used to neutralize completely the developer that remains on the print. The action of this acetic-acid bath is due to one of the most familiar chemical laws, namely, that an acid neutralizes an alkali and vice versa. The developer is invariably an alkaline solution, while the stop is an acid, and consequently, if the latter is sufficiently strong, the alkaline developer will be neutralized and entirely removed from the print.

It is the introduction of prints into the hypo bath with developer on them that causes the dirty brown spots so frequently seen. Not only this, but unless the prints are completely immersed in the hypo, the exposed portion of the print will continue to develop. Remember that developer has no place in the fixing solution, and it is the oxidized developer in the latter that causes it to turn brown. By using the acetic-acid solution, and mixing up a fresh one from time to time, if a large number of prints are being developed, clean prints will be obtained, and the fixing bath can be used until completely exhausted. The acetic-acid solution is entirely harmless to the prints, and as it is cheap, a clean stop should be used for each batch of prints.

Handy Milk-Bottle Carrier

Milk deliverymen and others who have occasion to carry several bottles at a time will find the carrier shown in the drawing a great convenience and timesaver. Two pieces of heavy-gauge wire or light iron rod are bent as shown, the horizontal parts being covered with rubber tubing. The joints where the ends of the rods meet are soldered, and the carrier is held together by a rivet at each end. By placing the bottles on the ground and releasing the grip on the handles the bottles are instantly freed.

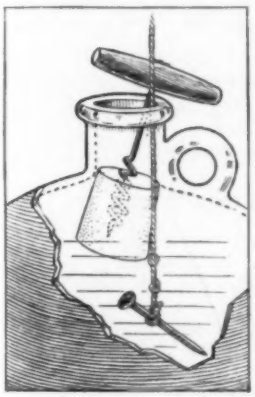


Testing Real and Artificial Silk

Real silk, when burned, smells like burning feathers, while artificial or "fiber" silk has the smell of burning wood. Another way of testing is to place a few threads from the sample into a test tube. The tube is heated and a piece of damp litmus paper held over the open end. If the sample is real silk, the paper will turn blue, but red if it is artificial.

Extracting Cork from Bottle

Corks that have been pushed past the neck inside a bottle or jug can be removed with comparative ease by a simple method. The vessel is filled with rather hot water, which softens the cork a little, and makes it easier to pull out. Then a large-headed nail, tied on the end of a string, is dropped into the bottle and the cork is maneuvered so that the small end partly enters the neck. The string is then pulled up so that the head of the nail bears against the bottom of the cork and the other end against the side of the vessel. It is now a simple matter to run a corkscrew into the cork, which is then easily extracted.—Arthur Nelson, Chicago, Ill.

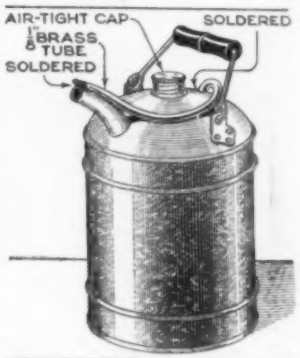


Planting Dwarf Varieties of Beans

Dwarf or bush beans are generally the earliest and hardiest. In garden culture they are planted in rows about 18 in. apart, 2 in. deep, and 3 in. apart in the row; in field culture, in drills 2 to 3 ft. apart, so that a horse-drawn cultivator can be used. Until the blossoming period, frequent but shallow cultivation should be given. Seed of the larger varieties should be planted with the eye downward. Two pounds of seed will be sufficient for 100 hills of limas, and 250 to 300 hills of other varieties, and for about 100 ft. of drill; 1 bu. should be planted per acre. Beans should never be worked when they are wet from dew or rain, as this causes rust. Beans can be planted so as to obtain a succession in the crop until within about 60 days of frost.

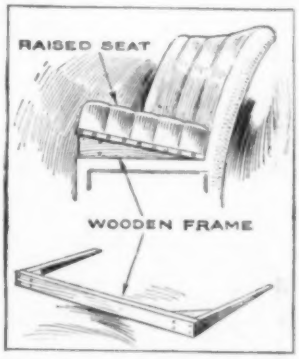
Nonoverflowing Lamp Filler

A length of brass tubing was fitted to the rear of the oilcan and the joint carefully soldered. The opposite end of the tube was then brought around and securely soldered to the spout in the manner shown, after flattening considerably the circular opening in the tube end. A leather washer was also placed underneath the screw cap to make it air-tight. In using this can, the end of the spout is inserted into the filling hole of the oil reservoir of the lamp or stove for a short distance. As the oil runs out, air enters at the end of the tube, but as soon as the level of the oil rises to the end of the spout, the air supply is cut off and the flow of oil ceases, thus preventing the liquid from overflowing.—Dexter W. Allis, Whitman, Mass.



Making Auto Seat More Comfortable

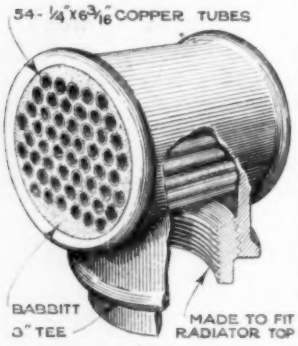
An automobile seat that is nearly flat is not the most comfortable for long hours of steady driving, as the driver slides forward each time the car is stopped or its speed reduced. An upward tilt given to the front edge of the cushion overcomes this to a great extent, and makes riding somewhat less tiring. To tilt the seat, a simple three-sided wooden frame is made and fitted underneath the cushion, as illustrated. The frame can be permanently attached with screws, if it does not interfere with the accessibility of tools or other accessories carried under the cushion.



¶The farm bell will be heard farther if placed on top of the windmill tower.

Condenser for Auto Radiators

The efficiency of alcohol in the radiator of an automobile to prevent the cooling water from freezing, depends entirely upon the quantity of alcohol present in the solution. Alcohol is quite volatile, and when the water becomes heated the alcohol quickly evaporates. However, if some form of condenser is used, the alcohol, and also more or less of the steam from the water, will be condensed so that the loss will be prevented and the solution retain its cooling and antifreezing properties for a longer time.



The drawing shows such a condenser, made from a 3-in. pipe tee and some copper tubing. Two pasteboard templates, cut to fit into the ends of the tee, were made to hold the ends of the copper tubes in place. Then, melted babbitt was poured into the side opening in the tee, fastening the tubes securely in first one end and then the other. The device is made to fit the radiator-filler pipe, and should be placed pointing toward the front of the car, so that the cold air will pass through the condenser tubes when the car is in motion.—Frank N. Coakley, Buffalo, N. Y.

Standard and Summer Time Shown on the Same Dial

It has been the experience of residents in some communities that neighboring towns have set their time ahead an hour during the summer months, while their own town did not. Naturally, the confusion under such a system is considerable, as those living in the separate communities must ever bear in mind two different time standards. A commuter found that by setting his watch to agree with the standard time in effect in his suburban town, he was continually being embarrassed by the conflicting daylight-saving time by which he did business in the city. In order to make his watch indicate both times, he had an extra set of red numerals lettered on the dial of his watch, for the daylight-saving time. These may be printed on small stickers, and stuck to the crystal of the watch, if it is not desirable to letter them directly on the dial.—M. J. Rystrom, Rockford, Ill.

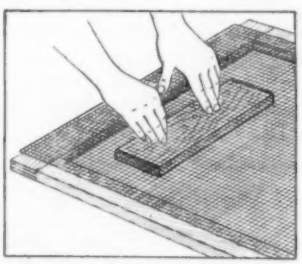
Tissue Paper as a Moth Preventive

A friend of mine keeps a uniform in a small closet, and, happening to be there at a time when the uniform was removed, I noted the absence of the usual mothballs. Upon asking him about this, I was shown a small quantity of tissue paper scattered around the closet, and also how the moths had eaten a considerable portion of the paper, but had not attacked the clothing. My friend said that he had never known clothes that had been wrapped in tissue paper to be harmed by the insects, as it appeared they preferred the paper to the cloth.—Carl H. Kaufmann, Santa Ana, Calif.

Applying Screen Wire

Drawing up screen wire tightly and evenly on the frame, is usually a rather difficult job, even when considerable care is used.

A very simple method that permits the screen to be drawn up tightly without leaving wrinkles and bulges, involves the use of nothing more complicated than a wooden block of about the same thickness as the screen frame. One end of the screen is tacked to the frame, and the block is placed inside at the opposite end. The screen is laid down over the block, and, placing the thumbs of both hands on the side of the frame or at the edge, and with the rest of the fingers bearing down on the block, the latter is drawn back, pulling the wire with it. When the proper tension has been obtained, it is held with one hand while a tack is driven with the other; this operation is repeated as necessary until the wire has been applied. The screen should be laid on a table or other flat surface in order to provide a support for the block.

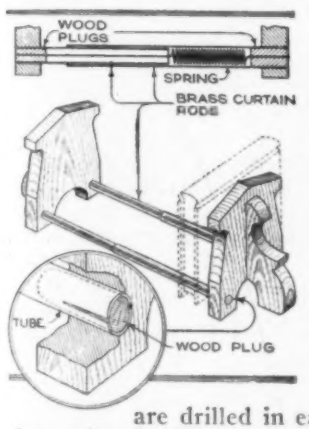


Cleaning Tarnished Silver

Tarnished silver may be cleaned by the so-called electrolytic method as follows: Place in a clean earthenware vessel, or an enamel one in which the enamel is unbroken, a solution of 1 teaspoonful of soda ash, or baking soda, and 1 teaspoonful of common salt, dissolved in 1 qt. of water. A sheet of aluminum or clean zinc is immersed in the solution, and the pieces to be cleaned are placed in contact with this; both the zinc or aluminum plate and the silverware to be cleaned should be completely covered by the solution. Heat nearly to boiling. When the tarnish disappears from the silver, rinse in cold water, and wipe with a soft cloth.

Self-Adjusting Book Ends

A convenient rack for holding the most commonly used books on the desk or library table can be made from two pieces of hardwood which are cut to form supports or ends; these can be either plain or as ornamental as the taste and woodworking talent of the maker decide. Holes are drilled in each, into which the ends of ordinary telescoping curtain rods are inserted. If there is any difficulty in getting the rods to fit tightly, the ends can be split with a hacksaw and wooden plugs driven in to expand the tubing. A short length of spring, having its ends secured to the opposite blocks inside of each rod, makes the fixture self-adjusting.



Rejuvenating Grass Rugs

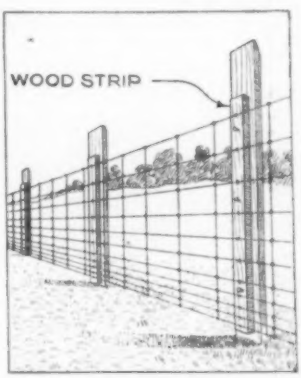
Grass rugs are largely used on porches, and for rooms in summer homes, and give an atmosphere of coolness. Whenever such a rug becomes frayed and worn, it can be brightened up, and its life considerably prolonged, by cleaning it thoroughly and applying one or more coats of paint of any desired shade.—H. A. Norrell, Augusta, Ga.

Novel Apron for Kitchen or Shop

It is only necessary to add a few eyelets along the bottom edge of an ordinary apron to increase its convenience very materially for certain classes of work. In use, the eyelets are placed over a corresponding number of small hooks, screwed into the underside of a table or bench, while the apron is tied around the waist in the usual fashion. The movements of the wearer are not in the least interfered with and she can sit or stand as desired. An apron of this kind will sometimes be found of service in factories and shops; in this case the apron may be fastened to the table or bench semipermanently, so that when the workers leave, it will be necessary only to untie the apron strings.

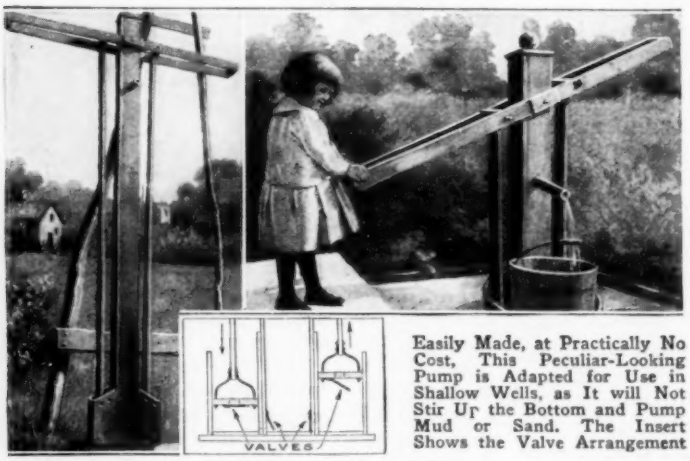
Facilitating Removal of Fence Posts

In most soils, wooden fence posts last but a few years, and in some localities, under particularly unfavorable conditions, their life is exceedingly short. Where woven-wire fence is used and attached to the posts with staples, a great deal of labor is necessary to pull the staples when a new post must be set, to take the place of one which has rotted off at the surface. If a piece of wood, about 1 by 3 in., is placed between the fencing and the post, and the staples driven into the strip, which is in turn fastened to the post with about three nails, the whole strip can be removed from the post easily, without in any way disturbing the staples, and without the hazard of breaking one or more strands of wire in attempting to remove them.



Homemade Pump for Shallow Wells

For pumping water from shallow wells, a simple wooden pump may be made, that costs practically nothing, and that is well worth the time spent in its construction. A square box is made, closed at each end, long enough to reach the bottom of the well, and to project 3 or 4 ft. above the ground. On two opposite sides of this box, at the bottom, holes about 2 in. in diameter are bored, and over these flaps of flexible leather are fitted; these flaps are nailed above the holes, so that they hang downward over the latter. On these sides of the box are built the two "cylinders," which are simply square open-top boxes, in height a little more than the stroke of the pump, but less than the depth of the water in the well; in these wooden blocks are fitted closely.



Easily Made, at Practically No Cost, This Peculiar-Looking Pump is Adapted for Use in Shallow Wells, as It will Not Stir Up the Bottom and Pump Mud or Sand. The Insert Shows the Valve Arrangement

A hole is bored in the center of each block, and a leather flap valve, similar to the ones previously made, fitted to the underside. A hole is also bored in the side of each cylinder opposite the one in the long box. The arrangement of the valves is clearly shown in the insert.

Iron yokes are made and fitted to the blocks, to carry the pump rods, which are also of wood. These rods are pivoted to the pump handle.

One peculiar advantage of a pump of this character is that, owing to the fact that there is no suction, the pump does not stir up mud or sand, in spite of the fact that it is set on the bottom of the well. This is so because the water flows over the tops of the cylinders. The water runs from the pump from a 2-in. spout which is placed at right angles to the handle.—Chester C. Cook, Chicago, Ill.

Nails as Campfire Irons

The camper usually finds it difficult to make a pile of stones around his campfire that will support the cooking utensils and at the same time allow sufficient space for a fire, provided the rocks can be obtained at all. The uncertainty and annoyance of the former method can be overcome by carrying a few 80-penny spikes in the kit. These are merely pushed into the ground and support the cooking utensils without interfering with the fire. Spikes of the size mentioned are about 8 in. long. —Lloyd L. Stewart, Ames, Ia.

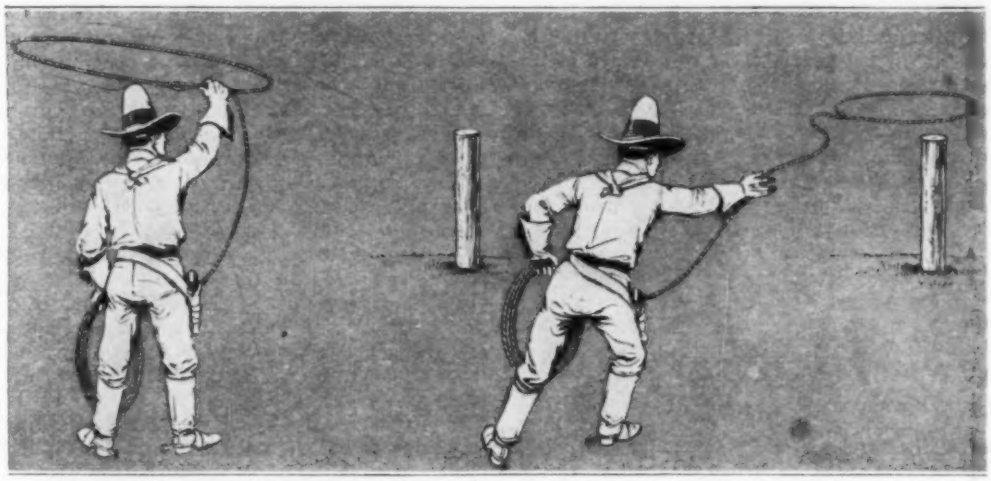
Soldering-Flux Containers

For the experimenter using small amounts of flux, there is no better container than one made from an old tooth-paste tube. Open the crimped end of the tube with a pocketknife, and, using the blunt end of a pencil, restore the tube as nearly as possible to its original cylindrical shape. Clean out the interior with a toothbrush. Cut a section out of a clean lampwick, and place it in the nozzle of the tube to be used as a spreader and feeder of the flux. Fill the interior of the tube loosely with absorbent cotton; then make up a saturated solution of zinc chloride, by dissolving the chemical in water until no more will dissolve, fill the tube, recrimp the end, and the container is ready for use. A container of this type will operate even more successfully with a paste flux, in which case the cotton filling and the wick in the nozzle will not be needed and are, therefore, omitted. —Werner W. Baumeister, Cambridge, Massachusetts.

THROWING THE LARIAT

By JOHN F. THORNTON Jr.

WHAT boy, after visiting a "Wild West" show, has not made a noose in a piece of old clothesline and set out to emulate the cowboy? Unless he has had instruction from some one proficient in the use of the lariat, however, it is probable that he has given up the attempt as useless. This is to be regretted, for besides being a typically American sport, lariat throwing is an educator of the eye, and an excellent developer of the muscles of the fingers, wrist, arm, shoulder, back, and legs. There is a good deal of fun in it, also, and it may be a very useful accomplishment. Many a hapless skater or canoeist has been saved by the prompt action of a spectator who was able to throw a rope with some degree of accuracy and skill.



The First Steps in Throwing the Lariat, Showing the Preliminary Swing and the Actual Cast: A Post, or Some Similar Object, is Used as a Target until Proficiency is Attained, When Some Moving Object may be Pressed into Service

The very best lariats are made of plaited rawhide. For practice, however, a rope of braided cotton or linen, ⅜ in. in diameter, will serve. The standard lengths for straight roping—catching objects—are 40 and 50 ft. For fancy swinging, a rope 16 ft. long will do.

Double the rope at a point 5 in. from the end. Bind it by winding both thicknesses for 1 in. with strong, light wire, as shown at the top of the full-page illustration. The loop, or eye, thus formed is called the hondoo (pronounced "ondoo"). Make it a little heavier by winding another piece of wire round its curved end, as shown. The chances are that one will have to try various amounts of wire, after he has begun to practice, until a hondoo has been obtained that will give the best results. Another form of hondoo is a small iron ring, or thimble, such as is used on sails. One end of the "lass rope" is unraveled, and the loose ends brought neatly round the ring from opposite directions, meeting again at the unwound part of the rope. Here they are bound tightly in place along each side of the rope with a piece of fine wire. The lariat is completed by drawing the other end of the rope through the hondoo, so as to form a running loop, and by knotting the unlooped end, to prevent it from unraveling.

Many lariat experts start with a loop about 1 ft. in diameter, and allow the rope to slip and the noose to grow larger as it is swung. It is best, however, to start practicing the throw with a large loop. Draw the rope through the hondoo until there is a noose 4 or 5 ft. long Bend the rope back at the hondoo until it lies along one side of the loop. Then grasp both thicknesses with the right hand, at a point about 15 in. from the hondoo.

The little finger should be between the two thicknesses, and the third and fourth fingers round both. The forefinger should cross under one thickness and extend along the underside of the loop rope, as shown in the illustration.

Take position in front of a post. Coil the slack rope in the left hand, so that it will slip off easily, coil by coil; be sure that there are no kinks in the line. Lift the noose over the head, and begin to swing it from right to left. Do not hold the wrist stiffly; imagine that it is an axle and that the loop is a wheel revolving in a horizontal plane over the head. When this movement has been practiced several times, it will be found that a quick, jerky turn of the wrist causes the loop to spread wide open.

It is well to practice this preliminary swing until it can be performed smoothly, before one attempts to make a cast. The proper time to throw the rope is at the moment when the swinging hand comes round from back to front. Step quickly forward, and bring the hand, palm down, forward and to the level of the shoulder. Let the arm stretch to its full length without interrupting the swinging motion, and let the loop go at the post.

The first cast will probably fall far short. But if these instructions have been followed, the noose will sail straight toward the mark without losing its circular form—and that is encouraging. If care is taken to regulate the size of the loop, the length and force of the swing, and the angle of the throw—and if patience and thoroughness in practicing casts are exercised—it will not be long before one becomes fairly expert in this, the first and most important use of the lariat.

The easiest of the cowboy's roping stunts is that of catching a man or animal as he passes at full speed. In roping an animal, the forefoot is always the target, never the head. The open loop is thrown just in front of the moving feet so that the side of the noose nearest the animal is on the ground and the other side is in the air. If the animal keeps moving a second longer, it will step into the noose and become securely caught. In roping animals use a small loop, as they will jump out of a large one. Wait until the steer, cow, or horse has passed, then it will not see the rope coming, and will be unable to dodge. If one is on foot and ropes an animal's head, see to it that the rope is at right angles to the animal; if one is behind it, one will be pulled along by it. One should brace oneself, with the rope held tightly across both thighs. It is a good idea to wear gloves to avoid any risk of burning the hands.

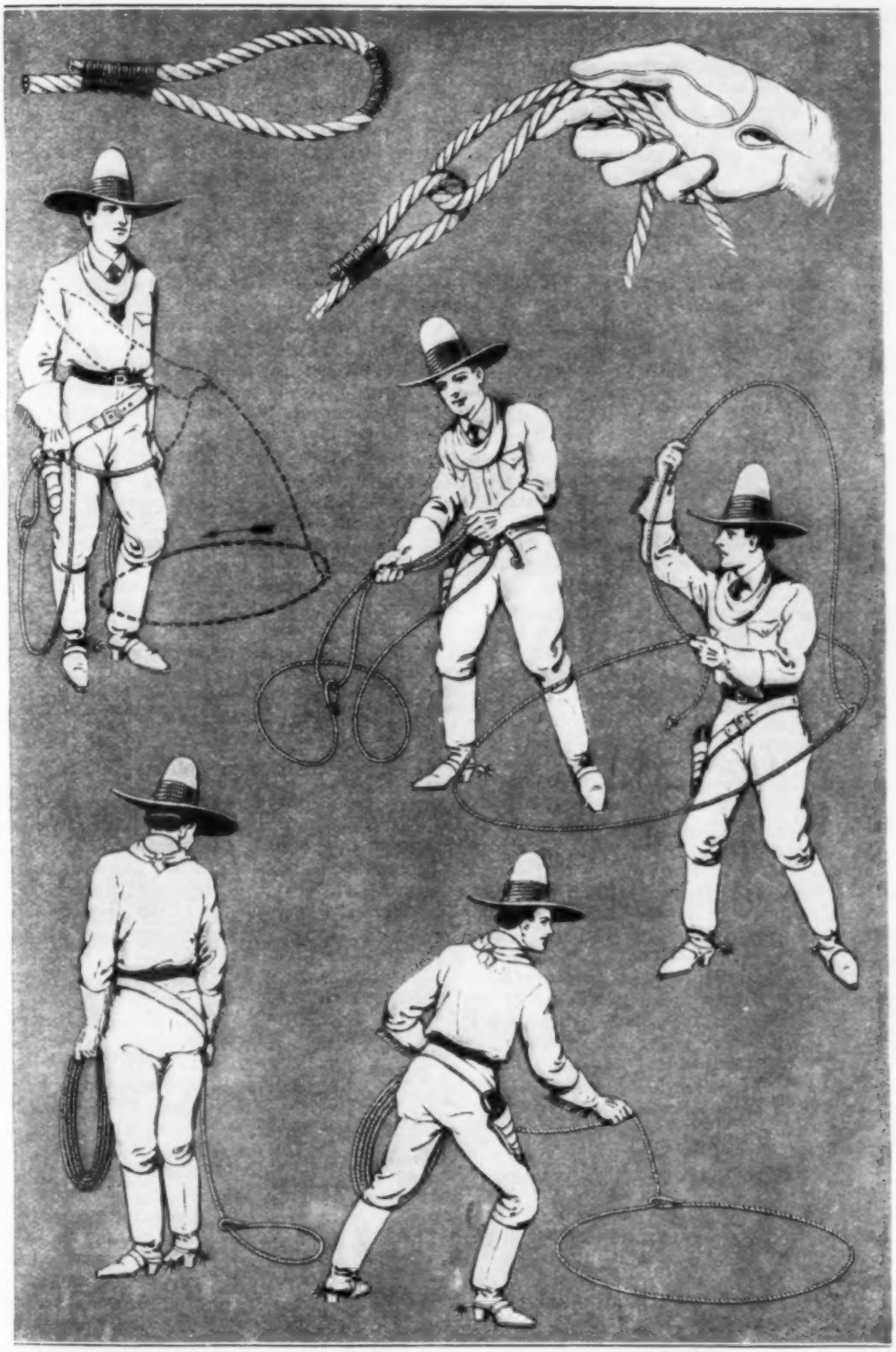
The "crinoline" is one of the most popular of the fancy lariat tricks. In this stunt the rope appears as a ring, about 5 ft. in diameter, revolving around the body as a center, about waist-high. Prepare for this trick as follows:

Holding the rope as for straight casting, extend the right hand, palm upward, straight out to the side until the arm forms an angle of about 30° with the body. Now, moving the hand rather slowly, describe a horizontal circle in front of the body. When the hand is at the farthest point in front of the body, and the circle is half completed, turn the wrist so that the palm is downward. At the same time drop the loop, but retain a firm grasp on that part of the rope which is held with the little finger, now using all the fingers to hold that part, as shown by the dotted lines in one of the illustrations. Do this without stopping the circular motion of the hand. Continuing to move the hand more or less rapidly in circles, widen the loop into a circle that spins round with a motion that corresponds to that of the hand. If the slack rope is twisted between the thumb and fingers of the left hand in the direction in which the circle is revolving, it can be kept from becoming tangled. One will not, of course, be able to spin the crinoline after ten minutes' practice, but persistent effort will very soon make one proficient.

In spinning the crinoline round the body a loop at least 7 ft. long will be needed. With the right hand grasp the loop as before, but this time about 3 ft. from the hondoo instead of 15 in. With the left hand hold the same side of the loop about 1½ ft. to the left of the part which is held in the right hand. Now, with these few exceptions, take the same position as before, with the left hand just in front of the right trouser's pocket. Such a position will leave part of the loop lying open on the ground to one side.

With a long, swinging, circular motion, bring the right hand up over the head. Use the left hand only to keep the loop open until the right hand has been raised. Then, without stopping the circular motion, drop the loop round the body. Continue to twist the right wrist and there will be a twirling crinoline spinning round the body. Its size can be regulated by the speed with which it is twirled.

A backhand throw is useful when the object is behind one. Hold the rope much as shown in the lower figures. Step back-

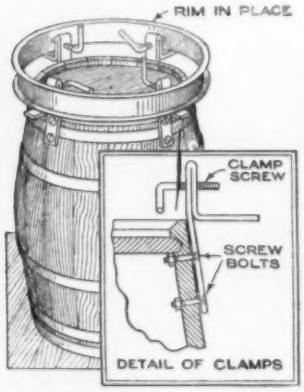


The Upper Figures Show the Method of Making the Hondoo and of Holding the Lariat; the Center Ones, the Position for Spinning the "Crinoline" in Front of the Body, the Method of Holding the Noose Before Dropping It over the Body, and the Crinoline Spinning around the Body. The Lower Figures Show the First and Second Positions in Making a Backhand Throw

ward with the right foot, turn facing the object and swing the loop backward and up. A cowpuncher takes care that his horse's head or tail is toward a roped animal. Otherwise he would be dismounted or his saddle would turn. He never ties his lariat to his saddle horn. It is a dangerous practice, for a steer or even a smaller animal, improperly roped, can throw a horse and man. The real cowboy holds the end of his lariat loosely in his left hand until his animal is caught. Then he takes a couple of quick hitches round his saddle horn that will hold if necessary, or that he can cast loose if occasion demands.

Holder for Demountable Rims

A tight-coopered wooden barrel, such as an old oil barrel, arranged as shown in the drawing, affords a very serviceable and substantial workbench for holding demountable rims while applying or removing a tire. Furthermore, the clamp screws serve as a means for expanding a split rim after the tire is in place, and the height of the barrel enables a convenient working position, as no stooping is required. Four combination brackets and screw clamps, of the type shown, are bolted to the outside of the barrel, the clamp screws being of sufficient length to make the device adjustable to rims of any standard size, and, also, to expand split rims. The brackets are forged from wrought iron. The lower extension on the brackets forms a rest for the rim so that it cannot slip off. When used outdoors, the barrel may be painted and lettered with the firm name, serving as a conspicuous advertisement. By filling the barrel with stones or concrete, it is almost impossible to move the device when working on it.



Fuller's Earth for Clutch and Brake

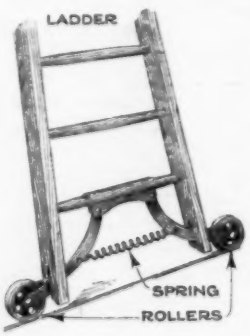
Fuller's earth can be applied to the clutch and brake linings of an automobile easily and thoroughly by using an ordinary insect-powder gun or bellows. The powder gun can be bought for a few cents and holds enough of the chemical for two or three heavy applications. Fuller's earth, and also talc, are used in the manner described to remedy the slipping of oil-soaked brake and clutch linings.

Razor Strop for Campers

An article that the camper generally leaves hanging on a tree or loses somewhere along the route is his razor strop. A veteran camper has developed an idea that makes it practically impossible to forget or lose the razor strop, by simply fastening it to the inside of his belt. A strip of a used strop, about a foot long, is cut and the ends are riveted to the inner side of the belt. The strop is thus always at hand; it is well protected, and by hooking the belt buckle over a nail or branch is ready for use immediately. There is really nothing lost by narrowing the strop to belt width, and it may be made of any length desired, so long as it does not interfere with the passage of the buckle when the belt is worn.—Robert Page Lincoln, Minneapolis, Minn.

Improvement for Rolling Ladders

The rolling ladders that form a familiar part of the equipment in most stores and factory stockrooms, sometimes have a disagreeable and disconcerting habit of rolling, especially if the person on the ladder happens to lean a little too far to one side. In order to overcome this objection, use has been made of the attachment illustrated, in which the wheels are mounted on the ends of curved arms, hinged in a bracket made to fit one of the rounds of the ladder. Ordinarily, when there is no weight on the ladder the spring pulls the wheels toward the center and raises the ladder from the floor, but as soon as anyone steps on the ladder, the tension of the spring is overcome, and the wheels are forced out until the end of the ladder is resting on the floor.—Edwin Schubach, Chicago, Ill.



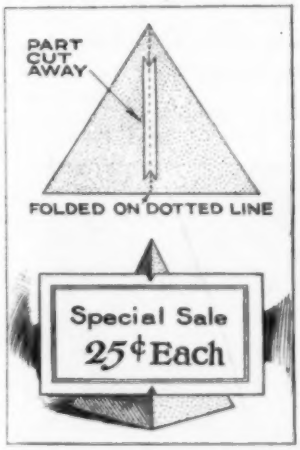
Protecting Trees from Insects

In summer, when it is desired that no ants, caterpillars, or other crawling insects, should climb the trees, some kind of a barrier is necessary.

The simplest, and one of the cheapest, methods is to place a wide band of cotton batting around the tree at some convenient height, fastening it to the tree with wire. The edges of the batting, protruding from underneath the wire, when fluffed, present an impassable barrier to any type of crawling insect or small animal, the cotton not affording a foothold for the latter.

Simple Price-Tag Holders

For holding display cards, and the like, securely, and in such a manner that they are difficult to upset, a simple holder can be made of stiff paper or cardboard. The stock from which the holder is to be formed is cut into the shape of a triangle which is then folded along its center. A slot is cut out along the center, as shown, and the triangular projections at each end of the slot serve to hold the card in place.—Frank N. Veloz, New York City.

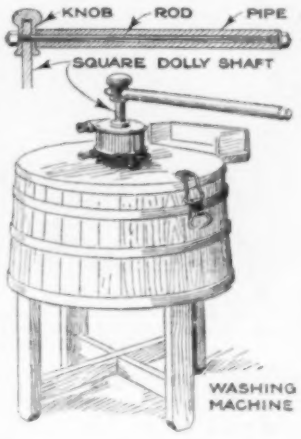


Glossy Photographic Prints

To make photographic prints with the highest possible gloss, the first requirement is that the grade of paper known as "glossy" be used. After they have been printed, developed, fixed, and washed in the usual manner, they are squeegeed face down, on a sheet of plate glass, that has been previously polished with a little French chalk on a cloth. The advantage of glass over the metal ferrotype plates ordinarily used is that one can look through the former to make sure that the entire print is in contact, without air bells between print and glass. However, the enameled ferrotype plates are much lighter and will not break.

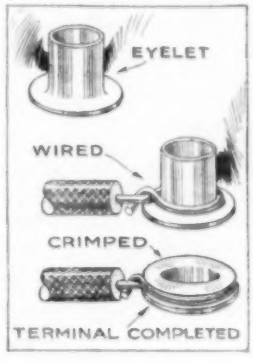
Emergency Washing-Machine Handle

Many a housewife using a water-power washing machine is handicapped on wash day by low water pressure or a defective or worn-out motor. Also, it may happen that the water supply has been cut off for repairs to the mains, and there are other emergencies in which the operating handle shown in the drawing will be found of great convenience. On machines of the type using a rotating-vane motor, the attachment of a suitable handle is a simple matter. The knob on top of the dolly shaft is usually held in place by a ¼-in. screw through both shaft and knob; this screw is removed, and a long ¼-in. stud run through the holes. A short section of ⅜-in. pipe is then slipped over the stud and clamped tightly in place with nuts and washers.



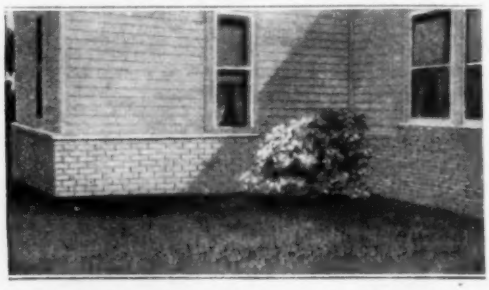
Wire Terminals Made from Eyelets

Practical terminals for electric wires that are held on bolt-and-nut binding posts, or for spark plugs, can be made by using the eyelets commonly obtainable at stationery stores for binding papers, and the hand punch used with them. To make such a terminal, the bare end of the wire is looped once around the eyelet, which is then crimped in the hand punch, pressing the metal down tightly against the wire and making a terminal that will fit neatly over the screw and give a good contact. If solder is used after crimping, a practically solid metal terminal is obtained that will give a minimum of trouble.



Concrete Wall Adds to Warmth of House

In seeking to modernize a dwelling by giving it the appearance of having a high foundation, the owner tried the experiment of applying a 2-in. thickness of solid cement directly over the original foundation and siding. In this way the cost of the improvement was kept at a lower figure than would have been the case had the house been raised and the foundation made higher.



Building a Low Cement Wall around a House to Improve Its Appearance: The Owner has Found That the Floors of the Dwelling Are Now Much Warmer in Winter Than Formerly

The main precaution taken was to see that there was a firm bond between the foundation and the wooden siding. At first glance it might seem that water would drip down between the concrete and siding, thus starting rot and giving frost a chance to open up cracks. Nails were driven into the siding at the corners of 6-in. squares, with their heads protruding, up to the height of the projected auxiliary wall. The concrete foundation was thoroughly cleaned and given a thin wash of pure cement. Then the forms were made and the concrete poured. A mixture of one part cement to two parts sand was used. The top of the wall fitted underneath the edge of one of the siding boards and was finished by increasing the thickness to 3 in. and sloping it slightly away from the house to run off the water; the corners were reinforced with wire mesh. After the concrete had set for about 24 hours, the forms were removed, and the surface marked off in imitation of brickwork, the lines being cut by running the point of a spike along a straightedge.

Keeping Linoleum Fresh

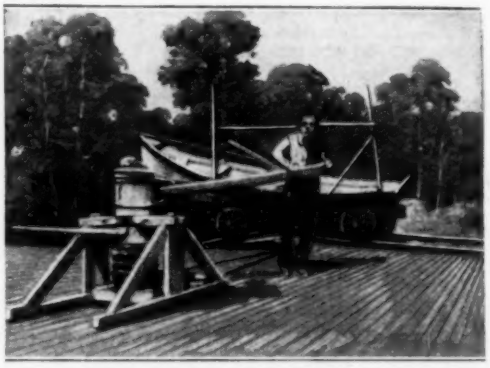
A mixture of equal parts of oil and turpentine, applied once a week, will keep linoleum looking fresh and clean. Palm oil, used alone, is also good, although not so good as the above mixture.

Poppies as Cut Flowers

Those who have undertaken to use Shirley or silk poppies as cut flowers are familiar with the shower of petals that follows cutting of the blossoms. Florists have a trick of preparing the poppies so that they can be used for cut-flower purposes. The bud of the poppy droops until it is ready to burst the green calyx that covers the flower, when it becomes erect. The flowers should be picked just before they shed this calyx, which is in two parts and splits at the bottom. The right moment for picking is when the calyx has split at the bottom just enough to show the color of the petals within. Cut the poppy at this stage, and gently pick off the green covering, place the crumpled-up bud in water, and the petals will open and will not fall off as they ordinarily do.

Hauling Boats from One Lake to Another

Faced with the alternative of digging a canal, buying two sets of equipment for use in twin lakes, or continue to carry their outfits from one to the other, a body of sportsmen solved the problem by means of a one-man marine railway.



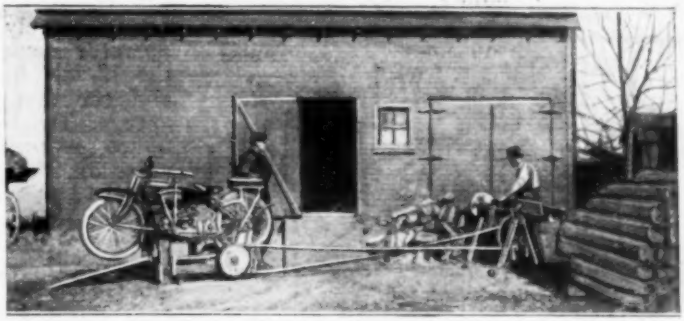
Hauling a Boat from One Lake to Another by a Miniature Marine Railway Is the Way a Body of Sportsmen Took to Avoid Digging a Canal to Connect Twin Lakes

An incline leads to each lake and a homemade capstan, or windlass, was located at the highest point, so that boats could be pulled up from either side. A single car or cradle, fitted with flanged wheels, runs on tracks laid on the inclines. In operation, the track is rolled into the water, the boat floated into the cradle, and pulled up by means of the windlass. Too rapid progress down the incline on the other side is prevented by means of a rope and snubbing block.—L. J. Ellison, Dubuque, Ia.

Using a Motorcycle for Power

An Illinois farmer uses his motorcycle for running light machinery about his farm, and while not as convenient as a gasoline engine, it can be used where there is not enough work for a heavy engine, as in this case. Of course, the motorcycle engine cannot be run as steadily as a water-cooled engine, but is good for jobs where it can be stopped occasionally and allowed to cool.

The motorcycle is run up onto a wooden framework or platform, and when in use is supported by its stand, at the rear, and by a wooden crosspiece under the frame directly behind the front wheel; this latter is removable and is not inserted until the motorcycle is in place. A pulley shaft, which has a sprocket wheel attached to it, is mounted on the frame, and after the motorcycle is in place, the chain is removed, shortened slightly, and reconnected around the sprocket on the shaft.



As There Is Not Enough Work to Require a Gasoline Engine, an Illinois Farmer Uses His Motorcycle to Furnish the Necessary Power for Grinding Feed, Cutting Up Firewood, and Other Light Jobs

A good-sized fan, driven by a belt from the shaft, and mounted so as to direct its breeze on the engine, is the simple means employed to prevent the engine from becoming overheated.—Charles Albert, Chicago, Ill.

Bridging Fuses

The fuse is the safety valve of the electrical system, put there for the protection of life and property. If a penny or a piece of wire is inserted when the fuse blows, that protection is removed, and the wires may grow red-hot, and even melt, thereby starting a fire in some concealed place, where it might not be discovered until too late to save the building. If a fuse blows, especially if it blows repeatedly, notify the lighting company, or a reputable electrician, and have any defects corrected. Fuses of standard make only should be used, if the utmost protection is to be given to the system.

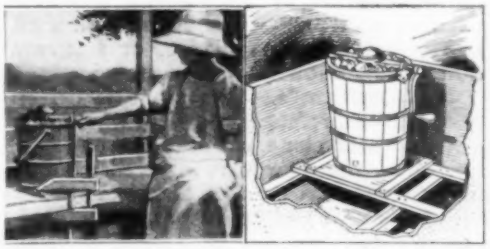
Clearing Stained Negatives

About as good a clearing bath as one can use for stained negatives—those that come out of the pyro-developing solution with too much yellow color—is made by dissolving 60 gr. or 1 dr. of powdered alum in 20 oz. of water, and adding 1 dr. of sulphuric acid. Immerse the negatives in this solution for a few minutes, remove, wash, and dry.

Reddish-looking spots with an irregular outline are caused by specks of iron in the water, and they will usually succumb to the sulphuric acid and water solution alone; this may be safely used twice as strong as indicated above.

Subduing the Ice-Cream Freezer

Two simple means of preventing the ice-cream freezer from moving with each revolution of the crank, by holding it to some solid support, are shown in the photograph and drawing. A piece of 1 by 8-in. board is nailed to the bottom of the bucket so that the ends project about 2 in. on either side. The freezer can then be

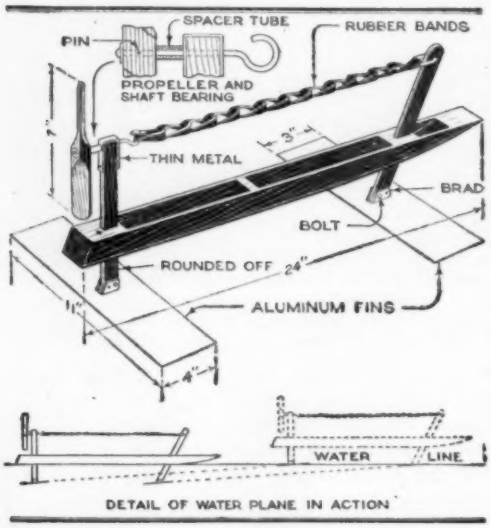


Two Methods of Holding the Ice-Cream Freezer Stationary: At the Left, a Board on the Bottom of the Freezer Allows It to be Clamped to a Solid Support; Right, the Wooden Frame inside a Laundry Tub

fastened with an ordinary clamp. The drawing at the right shows a frame set into a stationary laundry tub to bring the machine to a convenient height for operating. A movable frame was built to fit into the tub, and a piece of wood across the bottom of the freezer, as in the first example, rests between two cross strips on the frame and prevents the machine from moving.

A Toy Water Plane

The toy water plane shown in the drawing is something of a novelty in the way of model water craft, as the hull only



A Toy Water Plane That Rides on the Surface of the Water When Its Propeller is Revolving

rests upon the water when the propeller is not revolving. In traveling at full speed, the hull leaves the water quickly and rides with the fins on the surface of the water, as illustrated.

The sides and bottom of the hull are built up from strips of pine, about 1/8 in. thick, blocks being used to space the sides the proper distance apart and for the attachment of the wooden supports for the propelling mechanism and fins. The sheet-aluminum planes, or fins, are mounted as shown, so that each is tilted at the same angle. The plane is driven by a model-airplane propeller, which, for a 24-in. water plane, should be about 7 in. long, and the power is derived from a motor made of a number of rubber bands linked together.—Donald W. Clark, Buffalo, N. Y.

Another Use for the Electric Fan

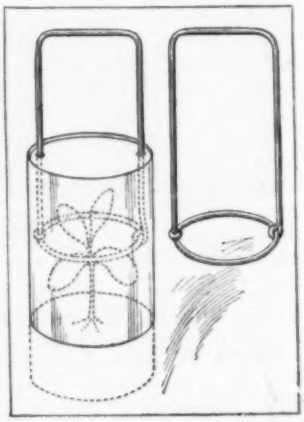
Electric fans of the oscillating type can be made to do double duty, as an advertising feature of a window display. This is done by attaching a circle of wallboard or light wood around the outside of the wire fan guard. Suitable advertising matter is painted on this, or small light articles, such as combs, pocketknives, and the like, can be attached without interfering with the ordinary operation of the fan.

Using Auto Battery as B-Battery

Knowing the inefficiency and weakness of the ordinary radio B-battery, and that the performance of the radio set depends largely upon this battery, an operator devised a method for tapping the 12-volt storage batteries of a truck and car that are housed in a near-by garage. Two sets of wires are run from the radio set to the garage, each set terminating, at the garage end, in a plug that will fit in the dash-lamp socket on the car and truck. The house ends of the wires are connected to the set in place of the B-battery. When the two motors are brought in in the evening, the dash bulbs are removed and the wires plugged in. This arrangement gives a 24-volt B-battery of great power. A rheostat is used to step down the voltage to that found to be the most efficient for the particular type of vacuum tube used. The amount of current drawn from the storage batteries is, of course, restored the next day, when the motors are running.—Philip A. Wall, Bedford, Massachusetts.

A Tool for Transplanting

When transplanting small plants, a simple device made from a tin can and a bit of stiff wire will save considerable work.



One of the ends of a can is melted or cut off square, so as to provide a cutting edge; two holes are punched through the opposite end and a U-shaped piece of wire is inserted, after which the wire ring is attached to the ends, as indicated. In use, the tool is placed over the plant and the can pushed into the ground for a sufficient depth, the plant and a quantity of earth being withdrawn inside the can when it is pulled from the ground. The plants are transplanted into holes, made in the same manner, by holding the roots and earth surrounding them down with the wire loop with one hand and withdrawing the can with the other.

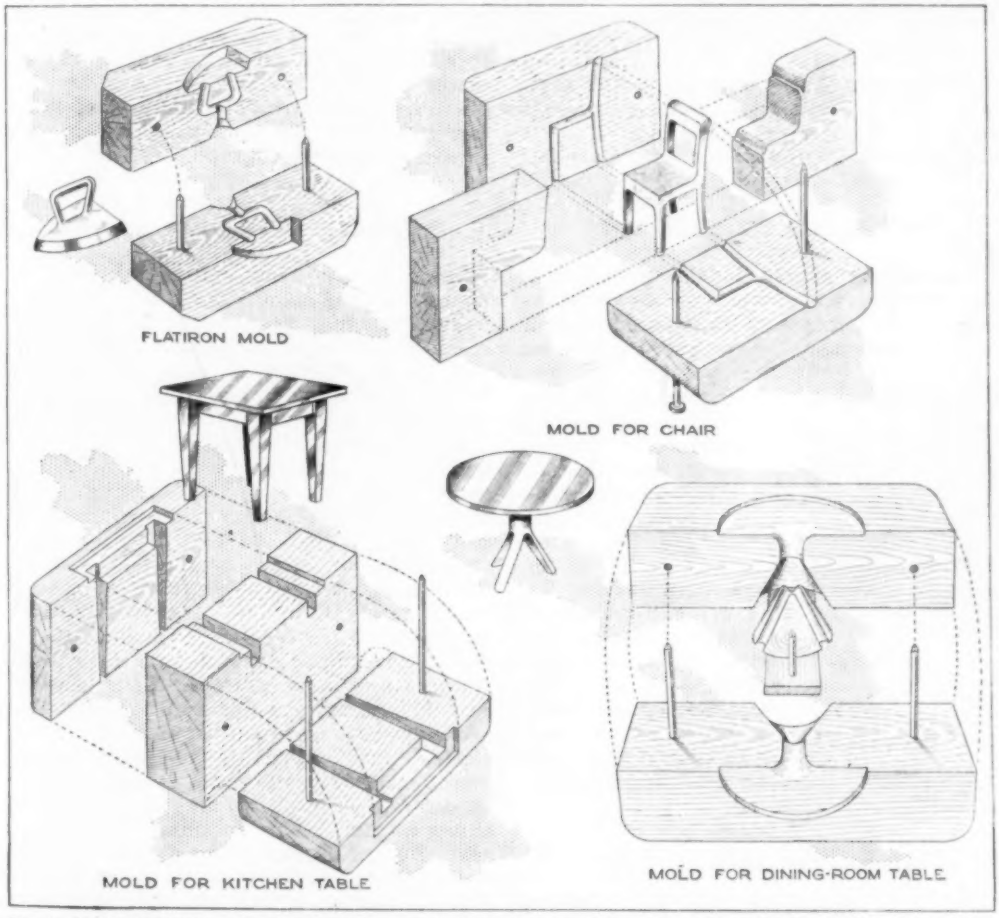
Making Lead Doll-House Furniture

By E. H. TINGLEY

THE ease with which soft wood may be worked with simple tools, and the low melting temperature of soft lead, make an ideal combination for the boy who desires to produce metal toys. The tools required are a small plane, hammer, chisel, knife, and a ladle for lead. The lead can be obtained from any plumber, by asking for the short pieces of lead pipe to be found in the scrap pile.

For the mold, any soft wood, free from knots, may be used. Blocks, of a size suitable for the toy to be made, are planed square on all faces. The blocks forming each half of the mold should be planed to the same size, then clamped together, and holes, a little smaller than the diameter of the wire nails used as dowels, drilled clear through both, as shown in the drawings. The blocks are then separated, and the design of the toy to be made drawn on the inner face of each block. Care should be taken that the design on each block will register with the other; that is, that they will come exactly opposite each other when the mold is closed. This may be accomplished by drawing reference lines across the top and ends of the blocks, when clamped together, separating the blocks, and drawing the lines across the faces.

When cutting out the molds, care must be taken to slope the sides of the cuts outward, giving them "draft," as a pattern-maker would say, so as to allow the pieces to be withdrawn from the molds without sticking. In making molds for tables, the tops should not be made too large or thick, as these molds are poured, top down, through the legs, and the lead will



Simple Molds for Making Lead Toys That can be Made by Any Boy with a Few Simple Tools: Scrap Lead Pipe, Obtainable from Any Plumber, Is the Material Used, and, with a Little Care in Making the Molds and Subsequent Trimming, Very Good-Looking Toys are Produced

not remain liquid long enough to run through the leg to the farthest corner of a large top. The parts of the toy must be proportioned with this in mind, and the lead kept hot, to secure good castings. The lead can be melted over the gas flame of the kitchen range, and a stove lid, heated fairly hot, used as a base for casting. The molds should be held firmly together and down on the stove lid while pouring. It is necessary that a warm metal surface, such as the heated stove lid, be used as a base, else the lead will chill and spoil the work.

Molds Used for the Flatiron, Kitchen and Dining-Room Tables and Chair, and Samples of the Toys Cast in Them

Lead remelted too often is not satisfactory for very small toys, as it becomes hard and brittle with repeated melting. The softer the lead, the easier it is to trim with a knife, to produce good-looking toys.

Other toys than those illustrated can be made by clever boys; dumb-bells, rocking-chairs, water pitchers, tenpins, etc., can be successfully produced. The method of making the molds is clearly shown in the drawings and photograph.

Vehicle Gate for a Driveway

The object shown in the photograph has not the appearance of the conventional gate, yet, set up in the middle of a private driveway, as shown, it prevents the passage of vehicles, but allows unobstructed access to pedestrians.

A 4-ft. length of 2-in. pipe, with horizontally projecting arms formed of pipe and fittings, rests in a socket imbedded in the cement driveway. A setscrew holds the "gate" tight. When a vehicle is to pass, the setscrew is loosened, the pipe is lifted out, and replaced when the automobile or carriage has passed.—Curtis Ralston, Chicago, Ill.

Driving Hornets from Nest

Hornets had built a nest in the eaves of a small garage, and their presence being undesirable, various means were tried to evict the potentially dangerous insects. A small plunger-type oil gun was filled with kerosene, and this was squirted onto the nest from a safe distance. The following day the nest had been completely evacuated.

The Care of Kerosene Lamps

Poor light is often caused by the condition of the lamps and wicks. The heavy oils that accumulate in the lamp should be thrown out every month, and the lamp thoroughly cleaned. Water should not be put in the lamp, nor should the wick be permitted to become damp. The lamp should be filled and cleaned, and the charred portion of the wick removed each time before lighting. Oil feeds to the wick better from a full lamp, and there is less danger of gas being formed in the lamp bowl. The wick is the vital part of the lamp, so it should be of good quality, of proper size, and long enough to reach to the bottom of the oil fount. New wicks should be supplied every month or two. They should be dried before the fire and put into the oil while still warm. Wicks clog gradually—clogged wicks make poor light; hence, economy in wicks is poor economy. A smoky flame may be due to a cheap burner, or to an unsuitable chimney. Burner and chimney should be kept clean. Burners may be cleaned by boiling with water to which a little soda has been added. Bad odors are almost always caused by heating and resulting evaporation of the oil on the outside of a dirty lamp or burner.

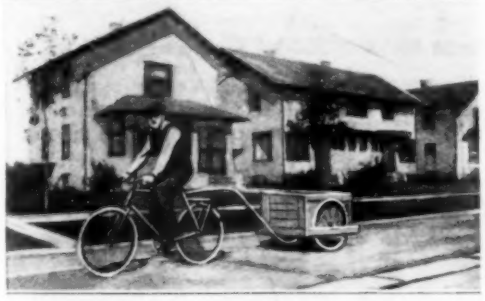
Kerosene dissolves various substances with which it comes into contact. These dissolved substances clog the wick, and the least water or moisture will make the

oil worthless. Keep the oilcan clean and dry. Good oil is sparklingly clear and brilliant.

So-called "safety powders," that are sold under the claim that they make the light brighter or prevent explosions, do not increase either the safety or illuminating power of the oil, and more than likely do positive harm by clogging the wick. They are usually sold with positive instructions to use clean oil, keep the lamp and wick clean, and the oil chamber full. If these instructions are followed, the result is a bright and safe flame, but the same result would be obtained by following the instructions—and throwing the powder away.

A Trailer for the Bicycle

Cultivating a three-acre garden tract six miles from home, the gardener built the bicycle trailer shown in the illustration to carry his tools and produce back and forth. The box body is a large wooden packing case mounted on a pair of stand-



A Bicycle Trailer, Built to Carry the Tools and Produce of an Amateur Gardener over the Six Miles between Home and Garden, has been Found Just as Useful When the Growing Season Is at an End

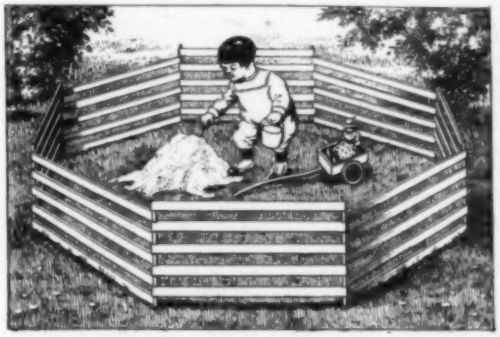
ard bicycle wheels. A 10-ft. length of pipe forms the connecting link with the cycle. After the growing season had come to a close, the owner used his trailer for hauling chicken feed, groceries, and similar loads.—Uri V. Averitt, Gary, Ind.

Testing Wool or Silk Goods

If a piece of goods that has been sold for all wool or genuine silk is suspected of being mixed with cotton or linen, the truth can be found by boiling a sample of the material in a five-per-cent solution of caustic soda for about five minutes. This treatment will boil out any silk or wool and leave the cotton or linen unchanged, if any is present. By weighing the sample before and after testing, the extent of the adulteration can be found.

A Simple Play Pen

A busy mother desired her baby to play out of doors as much as possible, but at the same time wished to restrain the

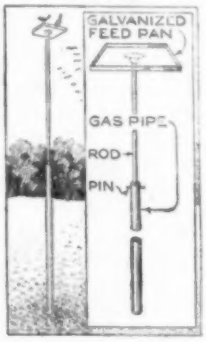


A Simple Form of Inclosure That Restricts the Movements of Its Juvenile Occupant is Made of Fruit and Vegetable Crates of a Familiar Type

movements of the child so that it would not wander off into possible danger. Being unable to keep a constant watch over the child, she evolved the simple form of inclosure illustrated. Certain fruits and vegetables are packed in crates made of a number of strips of wood joined together at the corners by lengths of heavy wire, passed through holes in the ends of the strips. Several of these crates were obtained and dismantled, then linked together at the ends to form a fairly large inclosure, which, when not in use, can be folded to occupy a small space.—Harry G. Schultz, Teaneck, N. J.

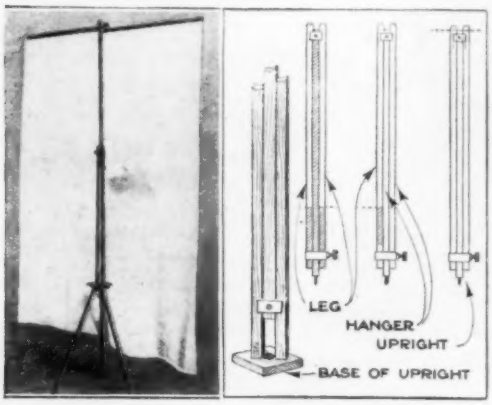
Feeding Tray for Birds

At several points about his thickly shrubbed and forested yard, a western business man and nature lover has installed feeding trays for his bird guests that remove them from the danger of cats, dogs, and other molesters. Lengths of pipe are set into the ground, and the galvanized-iron feeding trays are fitted to rods sliding in these. When the tray is to be filled, it is lowered, and when it is to be raised so that the birds may eat in safety, the rod is slid upward and a pin is inserted through a hole in the pipe, underneath the lower end of the rod.—Chas. A. Goddard, Los Angeles, Calif.



A Cheap Reflector for Home Photography

Good indoor portrait photography is impossible without a reflector, and a good one generally costs more than the aver-



A Reflector and Support That can be Made from an Old Camera Tripod will Equalize the Illumination and Reduce the Violent Contrasts of Light and Shadow

age amateur cares to pay. However, a very serviceable article can be made from the legs of an old camera tripod.

One of the old legs is sawed off to produce three pieces of equal length, about 1½ ft. long, and these are hinged to the tripod head to make a short tripod. The screws that hold these legs should be screwed down tightly so that the legs will stay in the position in which they are placed. The upright is made from another of the tripod legs, and this requires no alteration other than squaring the rounded ends. A square block of wood, about ½ in. thick, is screwed to the ends of this section to form a base. Between the two legs, a tripod socket from an old camera is imbedded in the block. This section, in use, is screwed to the top of the short tripod. For the horizontal hanger, from which the cloth reflector is suspended, the third section of the tripod has a short piece cut out of one of the side members. By loosening the setscrew, the hanger can be extended to about 3 ft. A loop of wire or cord should be fastened near the setscrew for hanging to the upright.

A piece of white cloth, about 3 by 5 ft., is used for the reflector, and a small pocket is sewed into each of the upper corners to slip over the ends of the hanger.

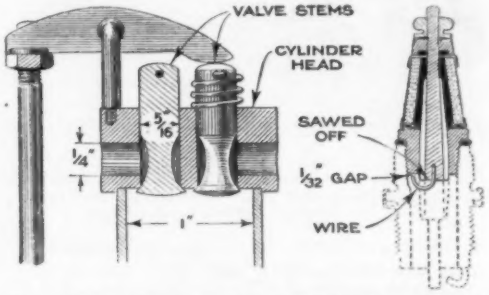
¶Blotting paper glued to the bottom of bric-à-brac prevents scratching polished mantels and sideboards.

Protecting Fruit Trees from Frost

Much of last year's fruit shortage, especially in the midwest and northern states, was due to the fact that the trees came into blossom earlier than usual, and were damaged by late-spring frosts. The method used by one fruit grower to avoid such a happening is worthy of note. While the ground in his orchard was frozen to a depth of several feet, he hauled the refuse from his barnyard and hayloft out, and spread it upon the ground under the trees, to a depth of 5 or 6 in. When the warm days of early spring followed, bringing neighboring orchards into blossom, his own orchard was as bare as it had been in the depth of winter. The heavy mulch of leaves and straw had held the frost underground, preventing the trees from budding. As soon as he was assured that all danger from frost was past, he removed the protecting mulch, and the trees came into blossom just late enough to miss the frost which destroyed the crops of other growers in his locality.

Hints for the Model Gas-Engine Builder

The maker of model gas engines is generally "up against it" when it comes to making valves in proportion to the size of



Simple Valves That will Operate Efficiently in a Model Gas Engine, and a Small Spark Plug That can be Made from Any of the Various Types of Separable Plug

the engine; also in trying to buy spark plugs of a corresponding scale on the market. A ¼-in. valve, made in the proportions of the regular ones, would have a stem too thin for practical purposes, and, in addition, would be difficult to turn on the lathe. One way out of the difficulty is shown in the drawing; the valve stem was turned to 5/16 in., for a 1-in. cylinder, and then cut away back of the head to make a passage for the gases, leaving a strong, durable valve. This makes it easy to machine the cylinder head, as it is only necessary to make seats for the valve

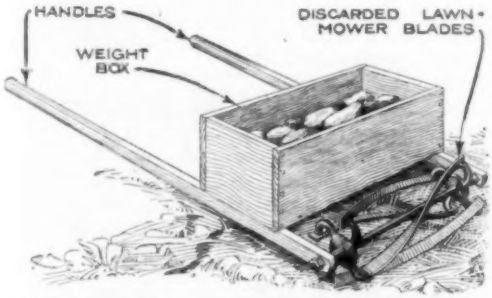
heads. The ports are drilled from the side, as shown.

There are several types of mica spark plugs on the market that are made separable to facilitate cleaning. Part of one of these may be used to make a neat plug for the model. The two parts of the plug are separated, and the long central electrode, or point, is sawed off at the point indicated, then drilled, and a piece of wire driven into the hole; this is bent to form a gap between it and the portion that screws into the cylinder. A gap of 1/32 in. is sufficient. The miniature cylinder head is then drilled and tapped in the most suitable place to take the spark plug. —Edwin J. Bachman, Fullerton, Pa.

A Novel and Effective Garden Mulcher

Because a garden plot is free of weeds, it does not necessarily follow that it is sufficiently cultivated; if the soil becomes hard, packed by the rain, and baked by the sun, the vegetables or flowers will not thrive. Consequently it is absolutely necessary that the top soil be kept loose if the plants are to develop in the manner they should.

For this purpose a revolving mulcher, made from the cutter reel of a discarded lawn mower, will be found better and easier to operate than a hoe. Make a pair of handles from strong material, and mount the cutter reel across the ends of the handles. Just back of the handles a box is made to hold as many stones or

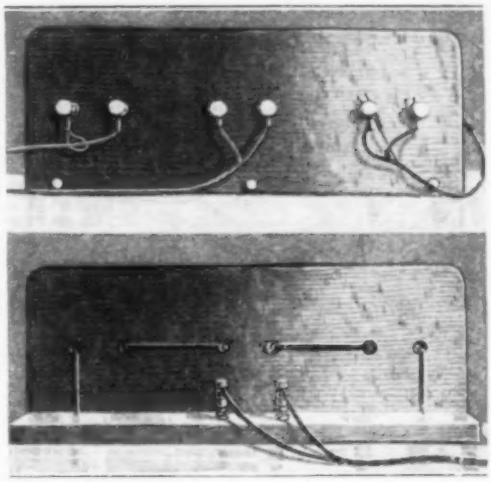


A Garden Mulcher and Weeder That can be Pushed Along between the Rows of Growing Plants is Easily Made from the Revolving Blades of an Old Lawn Mower

other weights as will be necessary to cause the mulcher to cut to the proper depth. In use the tool is pushed or pulled between the rows. The blades will revolve and cut into the soil and, due to arrangement of the cutters, the ground will be loosened and stirred up quite effectively.—G. E. Hendrickson, Argyle, Wisconsin.

Using Several Phones on Radio Receiver

The insistent demands of friends of the radio amateur that he entertain them at an evening of grand opera or musical



A Device for Connecting Several Sets of Phones to the Radio-Receiving Apparatus, Which is Located in Another Part of the Building, Making It Unnecessary for the Audience to Crowd into the Laboratory

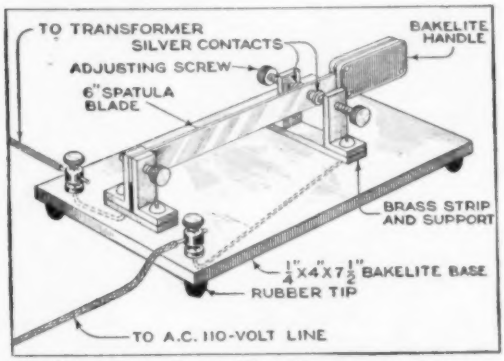
numbers generally present him with somewhat of a problem if he has but a single pair of phone terminals on his cabinet, and no loud-talking device. In the present case the placement of the phones in another room was also something of a problem. In order to connect the three sets of phones used, the device shown in the photograph was made. Two boards, each 18 in. long, and about 6 in. wide, were screwed together at right angles, and three pairs of binding posts were placed on the front and connected in series at the back. The connecting wires were then run underneath the base to the two binding posts at the rear. The lead from the phone terminals of the radio set were then run to the room and connected to the binding posts on the base.—W. J. McGuffage, Chicago, Ill.

Tire Chains for Emergencies

Repair sections for tire chains are obtainable for a few cents each, and these can be attached to the wheel of an automobile by stove bolts or wingnuts, without the necessity of jacking up the car. A few such sections, which should be long enough for their ends to meet when passed around the tire, placed on the rear wheels of the car, will furnish sufficient traction to enable it, in most cases, to be driven out of sand and mud.

How to Make a High-Speed Key

The "bug" or vibrating key has become quite popular with radio amateurs, and can no longer be considered the exclusive



A Vibrator-Type Transmitting Key for the Amateur Radio Operator, Which is Built Up from Easily Obtainable Parts, Makes It Possible to Develop Great Sending Speed

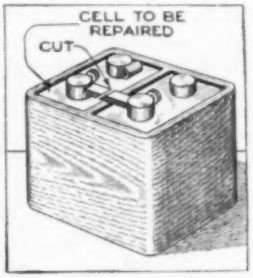
property of the commercial or professional operator. This type of key was first used by wire-telegraph operators to attain great speed, and, as it is easy to build and easy to operate, it is really a great improvement over the old-fashioned type of key. The movement of the key is from side to side instead of up and down, and with a little practice amazing speed in sending can be acquired. However, the operator should exercise some judgment, and not use so great a speed that he cannot transmit correctly.

The base, which is made of ¼-in. bakelite, is supported on rubber feet to permit the wires to be run on the underside, as shown by the dotted lines on the drawing. The vibrator, or blade, can be made from any of various materials, such as a thin, flexible nail file, hacksaw blades, and the like, although an artist's spatula, as shown in the drawing, makes an ideal blade. The original handle of the spatula is removed, and two strips of bakelite are cut to form an insulating handle, which is held together by small machine screws, so placed as not to come into contact with the blade. A ⅛-in. hole is drilled near the other end of the blade, which is supported between brackets of the type shown; these are formed from ⅛-in. sheet brass, and the blade is securely fastened between them by a screw. Machine screws are used for attaching the brackets to the base. The front brackets, near the handle, are made of the same material and to the same dimensions as those holding the blade at the rear. These brackets are mounted on a brass strip, and each is provided with a knurled-head screw, as indicated. Coin-silver contacts are soldered to the tips of these screws and to the blade, at the points where it makes contact with the screws.

Adjustments are easily made when the blade is in position, by merely turning the thumbscrews. When the key assembly is completed, one wire is led from the base of the contact-point brackets to one of the binding posts, and another is led from the supporting brackets at the end of the blade to the second binding post. Owing to the fact that the steel blade always tends to straighten itself no switch is needed, because, if the contact points are adjusted to a uniform distance from the blade, it will not come into contact with them when not in use. After the wiring is completed, and the terminals soldered, the key is ready to be connected in series with the supply line leading to the transformer.—F. L. Brittin, Chicago, Ill.

Repairing Storage Batteries

Storage batteries may be repaired without the trouble of removing the jars from the case, and without melting the crossbars in order to remove a set of plates. A diagonal cut is sawed in the connecting bar, as shown, and the plates of the defective cell are lifted out after the sealing compound has been sufficiently softened. After the plates have been repaired or the separators renewed, the crossbar is carefully soldered together. To facilitate soldering, the ends are pried up slightly and a piece of wood, or a piece of an old separator, is slid under the cut, which is then cleaned, fluxed, bent back into place, and soldered.



Removing Spots from Varnished Surfaces

To remove white spots from a varnished surface, make up, in the proportions given, the following mixture: raw linseed oil, ½ pt.; turpentine, ½ pt., and denatured alcohol, ½ pt. Shake well until thoroughly mixed. Dampen a piece of cheesecloth with this mixture and rub the spots several times, or until they disappear. If tightly corked, the mixture will keep indefinitely.

PRIZE OFFERS

MANY PRIZES FOR POSTERS AND ESSAYS TO INCITE KINDNESS TO ANIMALS

For the best humane posters and essays illustrating the idea of kindness to animals or human beings, numerous cash prizes are offered by the American Humane Association, Albany, N. Y. This is the national contest that succeeds the state contests, similar to the one for Massachusetts, announced last month in this magazine. The national contest is open to everyone, everywhere. It is divided into eight groups, as follows: group 1, for school grades 1-4; group 2, for school grades 5-8; group 3, for high-school grade 9; group 4, for art students, and anyone not in other groups; groups 5 and 6, for any person born before May 20, 1903; groups 7 and 8, for any person born after May 19, 1903. In each group there will be three prizes: first, $25; second, $15, and third, $10. Special prizes of $10, $5, and $3 in groups 6 and 8 will be awarded for the best cartoons with the words "Be Kind to Animals" published in any newspaper or magazine. Three additional prizes, open to all groups, will be awarded for posters or humane essays by pupils in U. S. Indian schools; also a prize of $25 will be given by the American Society for the Prevention of Cruelty to Animals, New York City, for the best poster suitable for publication by their society, and two other prizes of $10 and $5, given by the Pennsylvania Society for the Prevention of Cruelty to Animals for the best posters showing the cruelty of trapping animals for furs.

The rules of the contests are as follows: A competitor may submit any number of posters, maximum size 22 by 28 in. Group number in which poster is entered must appear on front and back of each drawing, with name and address of artist on the back alone. Posters must be sent, wrapped flat, carriage paid, to the Poster Department, American Humane Association, Humane Society Bldg., Albany, N. Y., so as to be received not later than May 20, 1922.

Besides the above prizes, others are offered for essays, to be mailed not later than 6:00 p. m., May 20, to the Association's Essay Contest Department, as follows: three prizes of $25, $15, and $10, given by the San Francisco Society for the Prevention of Cruelty to Animals for the best essays written by Boy Scouts on the protection of animals—open to Boy Scouts everywhere; also $50, given by the National Association of Audubon Societies, of which $25 will be awarded to a Campfire Girl and $25 to a Girl Scout for the best essays on the protection of birds. In these contests, essays must not exceed 800 words in length, and must be signed with the author's name and address.

FOUNDATION TO HELP TOWNS ESTABLISH PLAYGROUNDS

Of interest to every town and city in the country is a new foundation, established in New York by William E. Harmon. The corporation is to be known as the Harmon Foundation, and has for its object the application of sound business principles to many social movements, such as helping towns to establish playgrounds, and in advancing loans to college students through the organization of mutual-aid societies. The foundation will be guided by the principle of helping people to help themselves. For the present the entire time of the staff is being spent in helping towns to establish playgrounds, but later on divisions of vocational guidance, and of counsel to social organizations in financial matters, will be organized.

NEW INDUSTRIAL MACHINERY DIVISION IN DEPARTMENT OF COMMERCE

In the Bureau of Foreign and Domestic Commerce there has been organized the Industrial Machinery Division to provide American manufacturers of machinery with adequate government assistance. The new division will give attention to every kind of machinery in any branch of industry. In order that the division may be thoroughly practical in its work, men who are qualified engineers and who have sold a great variety of machinery for a number of years in South America and Asia have been placed in charge. The division aims to be of the greatest possible service to American manufacturers and exporters of machinery, and with this object in view, will establish as close contact as possible with these interests. An explanatory pamphlet has been published by the division.

FOUR YEARS' UNIVERSITY SCHOLARSHIP OFFERED HIGH-SCHOOL STUDENTS

For the third consecutive year, a four years' university scholarship is being offered to high-school students to encourage them in the study of highway economics, according to an announcement issued by the Highway and Highway Transport Education Committee. The scholarship is awarded for the best essay on the subject: "How Good Roads are Developing My Community." Essays are not to exceed 700 words in length, and must be in the hands of a high-school teacher or principal not later than May 1. All students of high-school grade, including both public and private schools, are eligible to compete. Essays must be written in proper manuscript form, with the name, school, and home address of the contestant in the upper left-hand corner of the first page.

Complete rules of the contest, a bibliography, suggestions, and other information may be obtained by applying to the Highway and Highway Transport Education Committee, Willard Building, Washington, D. C.

AMERICAN CERAMIC SOCIETY OFFERS AID IN RESEARCH WORK ON GLASS

For the encouragement of research work on glass, the research committee of the Glass Division of the American Ceramic Society offers to supply glass of any desired composition and form, free of charge and without limitation, to investigators in this field. The only obligation put upon the recipient is that of publication of the result of his investigations, preferably in the journal of the American Ceramic Society. Persons interested are requested to address one of the following members of the committee on research: E. C. Sullivan, Corning Glass Works, Corning, N. Y.; E. W. Washburn, University of Illinois, Urbana, Ill., or R. B. Sosman, Geophysical Laboratory, Washington, D. C.

MANY VALUABLE PRIZES TO BE AWARDED TO FOSTER BETTER-BRED LIVE STOCK

To stimulate the production of better-bred live stock, $5,000, divided into 35 prizes, is to be awarded at the cattle show to be held in November at the Bourbon Stockyards, Louisville, Ky. Entries will be open to all farmers and breeders of Kentucky, Tennessee, Georgia, and Alabama. There will be fat-cattle, as well as stocker and feeder awards. For the encouragement of boys' and girls' clubs formed for feeding cattle, a special class has been added to the show, in which prizes will be awarded of a value of $1,500. Anyone desiring more information should write to the Bourbon Stockyards, Louisville, Ky.

PRIZE FOR BEST NAME FOR A MACHINE THAT SAVES WOODWORKING LABOR

For the best name for a new woodworking combination machine that saws, planes, bores, grooves, makes miters, and is handy for all kinds of repair work, a prize of $100 is offered. The contest is not limited to woodworkers, and everybody is eligible to send in any number of suggestions. The name should be descriptive of the machine, and easy to remember. It must be received by May 1, 1922, written clearly with sender's name and address on any postal card or piece of paper, and addressed to Advertising Department, Hutchinson Manufacturing Co., Norristown, Pennsylvania.

GOOD TASTE IN MUSIC CULTIVATED BY MUSIC-MEMORY CONTESTS

Very popular, and in practice in a large number of schools now, is a form of contest that cultivates good musical taste in the school children and others. It is called a "music-memory contest." The object of these contests is to cultivate an appreciation of good music, and they are promoted by musical and literary clubs in coöperation with the schools. The method of procedure is to select some 30 or 40 classical-music numbers. These are played and sung before the contestants, and interesting information regarding them and their composers is told to the audience, whose business it is to make notes, and memorize it. This continues for about two months, when the examinations begin, to determine which of the contestants recognizes the music, upon its recital, and can give the best account of its origin and its composer.

NATIONAL "REPAIR IT NOW" CAMPAIGN DIRECTED AT MOTOR-CAR OWNERS

Aimed at the automobile owner, there is being directed from Chicago a national "Repair It Now" campaign. The object is to impress upon the motorist that repair parts, repair men, and everything connected with repair work are easy to get—now, and that later on they will be difficult to get. Local campaign committees are being organized to promote the campaign by means of advertising, bill-posting, and parades.

STANDARDIZATION OF ATHLETIC AWARDS IN ALL COLLEGES IS ADVOCATED

With the object of eliminating professionalism among college athletes, it is advocated by George L. Rider, athletic director of Washington University, that all awards in any kind of athletics should be standardized. At present some colleges and universities are awarding more valuable prizes than others, and this naturally attracts the "tramp athlete." If all schools and colleges would agree on standard awards, preferably in the form of medals, the tramp athlete would soon be a thing of the past.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize $10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Model in Clay by Students of Chicago Art Institute: Prizes, $1,000, $100, and $50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

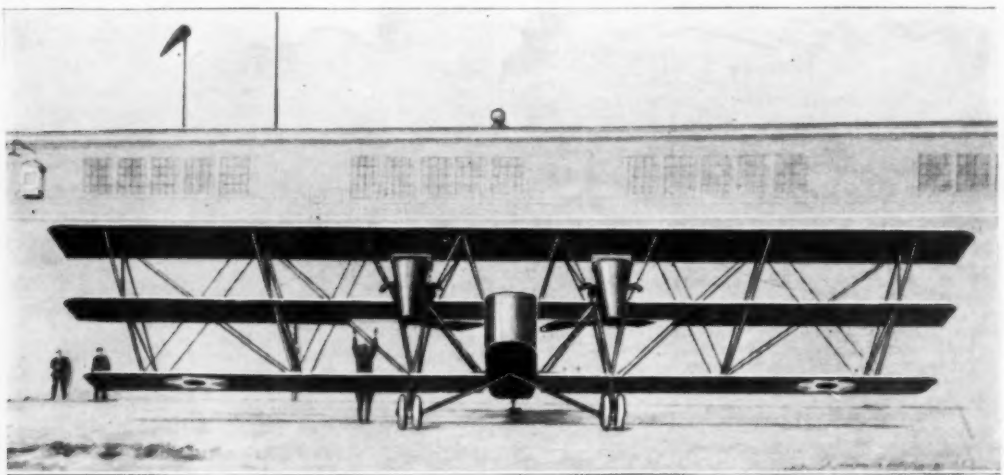
Best Slogan Describing Razor: Prize $500; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

American-History Essays: Prizes, $3,000 for professors, $2,000 for specialists, $1,000 for school-teachers, $1,000 for students, and $500 for undergraduates in U. S. colleges; announced March issue, 1922; closes May 31. Address, Knights of Columbus Historical Commission, K. of C. Bldg., 199 Massachusetts Ave., Boston, Mass.

Best Setting of a Song: Prize $100; announced April issue, 1922; closes July 1, 1922; address, D. A. Clippinger, 617-18 Kimball Building, Chicago, Ill.

Man-Propelled Airplane: Prize 20,000 francs; announced April issue, 1922; closes September 13, 1922; address, Maison Peugeot, 80 Rue Danton, Levallois-Perret (Seine), France.

In answering prize offers please mention Popular Mechanics Magazine



ARMORED TRIPLANE CARRIES ONE CANNON AND SIX MACHINE GUNS

THE latest development in American aviation is this triplane in which all vital parts are protected by armor. As armament it carries a cannon firing a one-pound shell, and has also six machine guns which can be fired in practically all directions. In addition, it carries 10 bombs, and when fully loaded weighs almost five tons. It has a flying speed of 105 miles per hour and a climbing speed of 600 ft. per minute.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]